South Star Cogeneration LLC is seeking approval from the CEC to construct and operate the South Star Cogeneration Project (South Star) in western Kern County approximately 35 miles southwest of Bakersfield, California. The South Star Project will consist of two substantially identical cogeneration plants, South Star I (Section 17, T32S, R23E) and South Star II (Section 7, T32S, R23E), that are located approximately 1.5 miles apart on contiguous Texaco California Inc. (TCI) property in the South Midway-Sunset Oilfield. The Application for Certification (AFC) presents an evaluation of the entire South Star Project in a manner to clearly indicate the environmental effects associated with each site and its related linear facilities.

South Star I includes the following project components shown on Figure 2-1:

- South Star I site;
- Replacement of poles and conductor for approximately 4.7 miles of existing 12.47 kV transmission line;
- 0.6 mile 115 kV transmission line extension to South Star I site;
- Alternative stand-alone 5.3 mile 115 kV transmission line;
- 3.6 miles of natural gas line (Kern-Mojave to Station 109 and natural gas line placed within TCI South Midway Utility Corridor Segment A);
- Approximately 2.4 mile Alternative Route 1 natural gas line; and
- Improved access road (Midoil Road to South Star I site).

South Star II includes the following project components as shown on Figure 2-1:

- South Star II site;
- 3.8 mile addition of second 115 kV circuit on proposed South Star I transmission line;
- 1.4 miles of natural gas line (placed within TCI South Midway Utility Corridor Segment B);
- Alternative aboveground Route 2 natural gas line; and
- Improved access road (Midoil Road to South Star II site).

This analysis of the potential air quality impacts of the South Star Cogeneration Project (South Star Project) was conducted according to California Energy Commission

(CEC) power plant citing requirements. The analysis also addressed U.S. Environmental Protection Agency (U.S. EPA) Prevention of Significant Deterioration (PSD) requirements and San Joaquin Valley Air Pollution Control District (SJVAPCD) permitting requirements for Determination of Compliance/Authority to Construct (DOC/ATC). The details of the analysis are contained in the following sections:

- Section 8.1.1 describes all applicable laws, ordinances, regulations, and standards (LORS). Also, Table 8.1-29 describes how the South Star Project complies with each applicable LORS.
- Section 8.1.2 describes the local environment surrounding the South Star Project sites. Meteorological data, including wind speed and direction (i.e., windroses), temperature, relative humidity, and precipitation are discussed, and ambient concentrations for the appropriate criteria pollutants are summarized.
- Section 8.1.3 provides a summary of best available control technology (BACT) for gas-fired turbines. Also, mitigation of fugitive dust during construction is discussed. A detailed BACT analysis is provided in Appendix B and explains how the use of dry low nitrogen oxide (NO_x) combustors and selective catalytic reduction (SCR) with ammonia injection meet NO_x BACT requirements.
- Section 8.1.4 evaluates the South Star Project's air quality impacts from NO_x, carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compound (VOC), and particulate matter less than 10 micrometers (μm) in diameter (PM_{10}) emissions. Emission estimates are presented for these pollutants for project construction and operation over a range of operating modes, including startup and shutdown. The modeling analysis conducted for nitrogen dioxide (NO_2), CO, SO_2, and PM_{10} is presented; the results show no negative impacts to the California and federal Ambient Air Quality Standards (AAQS).
- Section 8.1.6 presents the results of a cumulative impact analysis (including off-project sources that have been permitted, or are in the processing of permitting, and are not yet operational).
- Section 8.1.7 describes the South Star Project emission offset strategy, including potential offset sources and locations.
- Section 8.1.8 lists the references used to conduct the air quality assessment.

Some air quality data are presented in other sections of this Application for Certification (AFC), including an evaluation of toxic air pollutants (see Section 8.6) and information related to the fuel characteristics, heat rate, and expected capacity factor of the proposed facility (see Section 2.0). For the purposes of this air quality analysis, each of the

South Star Project facilities, South Star I and South Star II, were considered separately. References to the South Star Project are meant to consider both facilities. Where results or conclusions differ, the individual facility designation is used.

8.1.1 Laws, Ordinances, Regulations, and Standards

The applicable LORS related to the potential air quality impacts from the South Star Project are described below. These LORS are administered (either independently or cooperatively) by U.S. EPA Region IX, CEC, the California Air Resources Board (ARB), and the SJVAPCD.

8.1.1.1 Ambient Air Quality Standards

U.S. EPA, in response to the federal Clean Air Act (CAA) of 1970, established federal AAQS in 40 Code of Federal Regulations (CFR) 50. The federal AAQS include both primary and secondary standards for six "criteria" pollutants. These criteria pollutants are ozone (O_3), CO, NO_2, SO_2, PM_{10}, and lead (Pb). Primary standards were established to protect human health, and secondary standards were designed to protect property and natural ecosystems from the effects of air pollution.

The 1990 Clean Air Act Amendments (CAAA) established attainment deadlines for all designated areas that were not in attainment with the federal AAQS. In addition to the federal AAQS described above, a new federal standard for particulate matter less than 2.5 μm in diameter ($PM_{2.5}$) and a revised O_3 standard were promulgated in July 1997. Under an interim policy, the PM_{10} and 1-hour O_3 standards will continue to be implemented for the next several years while the new standards are being phased in. In 1988, as part of the California Clean Air Act, the State of California adopted the California AAQS that are in some cases more stringent than the federal AAQS. The state and federal AAQS are summarized in Table 8.1-1.

The U.S. EPA, the ARB, and the local air pollution control districts determine the air quality attainment status of designated areas by comparing local ambient air quality measurements from the state or local ambient air monitoring stations with the federal and California AAQS. Those areas that meet ambient air quality standards are classified as "attainment" areas; areas that do not meet the standards are classified as "nonattainment" areas. Areas that have insufficient air quality data may be identified as unclassifiable areas. These attainment designations are determined on a pollutant-by-pollutant basis. The western portion of Kern County has been designated as a federal and state nonattainment area for O_3 and PM_{10}. The attainment status for all other criteria pollutants is considered unclassified due to insufficient monitoring data; however, U.S. EPA considers that these pollutants are in attainment. Table 8.1-2 presents the attainment status (both federal and state) for the western portion of Kern County located in SJVAPCD jurisdiction.

As mentioned above, both U.S. EPA and the ARB are involved with air quality management in western Kern County along with SJVAPCD. The area of responsibility for each of these agencies is described below.

U.S. EPA has ultimate responsibility for ensuring, pursuant to the CAAA, that all areas of the United States meet, or are making progress toward meeting, the federal AAQS. The state of California falls under the jurisdiction of U.S. EPA Region IX, which is headquartered in San Francisco. U.S. EPA requires that all states submit State Implementation Plans (SIPs) for nonattainment areas that describe how the federal AAQS will be achieved and maintained. U.S. EPA has delegated this attainment responsibility to the ARB.

The ARB, in turn, has delegated attainment responsibility to regional or local air quality management districts (or air districts), such as SJVAPCD. The ARB is responsible for attainment of the California AAQS, implementation of nearly all phases of California's motor vehicle emissions program, and oversight of the operations and programs of the regional air districts.

Each air district is responsible for establishing and implementing rules and control measures to achieve air quality attainment within its district boundaries. The air district also prepares an air quality management plan (AQMP) that includes an inventory of all emission sources within the district (both man-made and natural), a projection of future emissions growth, an evaluation of current air quality trends, and any rules or control measures needed to attain the AAQS. This AQMP is submitted to the ARB, which then compiles AQMPs from all air districts within the state into the SIP. The responsibility of the air districts is to maintain an effective permitting system for existing, new, and modified stationary sources, to monitor local air quality trends, and to adopt and enforce such rules and regulations as may be necessary to achieve the AAQS.

8.1.1.2 Prevention of Significant Deterioration Requirements

In addition to the ambient air quality standards described above, the federal PSD program has been established to protect deterioration of air quality in those areas that already meet national ambient air quality standards. Specifically, the PSD program specifies allowable concentration increases for attainment pollutants due to new emission sources. These increases allow economic growth while preserving the existing air quality, protecting public health and welfare, and protecting Class I areas (national parks and wilderness areas). Each South Star site is considered a separate source pursuant to PSD regulations. Annual emissions from each of the South Star Project facilities (South Star I and South Star II) are below the applicable 100 ton per year PSD major source thresholds, therefore the PSD regulations do not apply to either of the facilities that comprise the South Star Project.

8.1.1.3 Acid Rain Program Requirements

Title IV of the CAAA applies to sources of air pollutants that contribute to acid rain formation, including sources of SO_2 and NO_x emissions. Title IV is implemented by the U.S. EPA under 40 CFR 72, 73, and 75. Allowances of SO_2 emissions are set aside in 40 CFR 73. Sources are required to obtain SO_2 allowances, to monitor their emissions, and obtain SO_2 allowances when a new source is permitted. Sources such as the South Star Project that use pipeline-quality natural gas are exempt from many of the acid rain program requirements. However, these sources must still estimate SO_2 and CO_2 emissions, and monitor NO_x emissions with certified continuous emissions monitoring systems (CEMS). All subject facilities must submit an acid rain permit application to U.S. EPA within 24 months of commencement of operation.

8.1.1.4 New Source Performance Standards

New Source Performance Standards (NSPS) have been established by U.S. EPA to limit air pollutant emissions from certain types of new and modified stationary sources.

The NSPS regulations are contained in 40 CFR 60 and cover nearly 70 source categories. Stationary gas turbines are regulated under Subpart GG. The enforcement of NSPS has been delegated to the SJVAPCD, and the NSPS regulations are incorporated by reference into the District's Rule 4001. In general, local emission limitation rules or BACT requirements are more restrictive than the NSPS requirements. For example, the controlled NO_x emissions from the South Star Project's stationary gas turbines will be less than 2.0 parts per million by volume dry (ppmvd) at 15% oxygen, significantly less than the NSPS limit of 120 ppmvd at 15% oxygen.

The NSPS NO_x standard was calculated according to 40 CFR 60.332 as follows:

$$STD = 0.0075 \times \left(\frac{14.4}{Y}\right) + F$$

Where: STD = Allowable NO_x emission standard (% by volume at 15% O_2 dry basis)

Y = Manufacturer's rated heat rate based on lower heating value

F = NO_x emission allowance for fuel bound nitrogen

The allowable NO_x emission standard was calculated as 0.012% by volume (or 120 ppm) for the South Star Project based on the following:

Y = 8,885 Btu/kW-hr (or 9.3746 kJ/W-hr)

F = 0 (worst-case condition)

The NSPS fuel requirements for SO_2 will be satisfied by the use of natural gas, and emissions and fuel monitoring will be performed to comply with NSPS, acid rain, and other regulatory requirements.

8.1.1.5 Federally Mandated Operating Permits

Title V of the CAA requires U.S. EPA to develop a federal operating permit program that is implemented under 40 CFR 70. This program is administered in Kern County by SJVAPCD under Rule 2520. Each major source must obtain a Part 70 permit. Permits must contain emission estimates based on potential-to-emit, identification of all emissions sources and controls, a compliance plan, and a statement indicating each source's compliance status. The permits must also incorporate all applicable federal requirements. Permit applications must be submitted within 12 months after plant startup.

8.1.1.6 Power Plant Siting Requirements

Under the California Environmental Quality Act (CEQA), the CEC has been charged with assessing the environmental impacts of each new power plant and considering the implementation of feasible mitigation measures to prevent potential impacts. CEQA Guidelines (Title 14, California Administrative Code, Section 15002(a)(3)) state that the basic purpose of CEQA is to "prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible."

The CEC's siting regulations require that a new power plant can only be approved if the South Star Project complies with all federal, state, and local air quality rules, regulations, standards, guidelines, and ordinances that govern the construction and operation of the proposed project. A project must demonstrate that project emissions will be appropriately mitigated to ensure that the impacts from the project are insignificant and will not jeopardize attainment and maintenance of the AAQS. Cumulative impacts, impacts due to pollutant interaction, and impacts from noncriteria pollutants must also be considered.

8.1.1.7 Air Toxics "Hot Spots" Program

As required by the California Health & Safety Code Section 4430, all facilities with criteria air pollutant emissions in excess of 10 tons per year are required to submit air toxic "Hot Spots" emissions information. This requirement is applicable only after the start of operation. Section 8.6, Public Health, of this AFC indicates that there will be insignificant air toxics impacts from the South Star Project.

8.1.1.8 Authority to Construct and Permit to Operate

Under Rule 2010, SJVAPCD regulates the construction, alteration, replacement, and operation of sources that may emit air contaminants through the issuance of air permits (i.e., Authority to Construct and Permit to Operate). This permitting process allows the

SJVAPCD to adequately review new and modified air pollution sources to ensure compliance with all applicable prohibitory rules and to ensure that appropriate emission controls are used. An Authority to Construct (ATC) allows for the construction of the air pollution source and remains in effect until the Permit to Operate (PTO) application is granted, denied, or canceled. For power plants under the siting jurisdiction of the CEC, the SJVAPCD issues a Determination of Compliance (DOC) in lieu of an ATC. The DOC is incorporated into the CEC license. Once the project commences operations and demonstrates compliance with the DOC, SJVAPCD will issue a PTO. The PTO specifies conditions that the air pollution source must meet to comply with other air quality standards and will incorporate applicable DOC requirements.

8.1.1.9 New Source Review Requirements

New Source Review (NSR) rules establish the criteria for siting new and modified emission sources. SJVAPCD has been delegated authority for NSR rule development and enforcement; the District's NSR rules are contained in Rule 2201. There are three basic requirements within the NSR rules. First, BACT must be applied to any new source that emits above specified threshold quantities. Second, all potential emission increases from the source above specified thresholds must be offset by real, quantifiable, surplus, permanent, and enforceable emission decreases in the form of emission reduction credits (ERCs). Third, ambient air quality impact assessments must be conducted to confirm that the proposed project does not cause or contribute to a violation of a federal or California AAQS or jeopardize public health.

8.1.1.10 Other Prohibitory Rules

Three applicable SJVAPCD rules address operation emission limits for the South Star Project: Rule 4201, Rule 4703, and Rule 4801. Rule 4201 limits total suspended particulate matter emissions (TSP) from any source operation to 0.1 grains per cubic foot of gas at dry standard conditions. Rule 4703 limits NO_x and CO emissions from stationary gas turbines rated at equal to or greater than 0.3 megawatts (MW). To demonstrate compliance with Rule 4703, an emission control plan must be submitted and emissions monitoring and recordkeeping must be performed. Rule 4801 limits the discharge of sulfur compounds from any source operation to 0.2 percent by volume calculated as SO_2 on a dry basis.

Two SJVAPCD rules apply to the South Star Project that prohibit visible emissions and emissions that may be considered a nuisance. Rule 4101 (Visible Emissions) limits emissions of visible air contaminants by prohibiting any emissions that exceed darkness and opacity levels designated as No. 1 on the Ringelmann Chart. Rule 4102 (Nuisance) prohibits any emissions "which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such person or the public or which cause or have a natural tendency to cause injury or damage to business or property."

Applicable fugitive dust requirements are implemented by SJVAPCD Rules 8010 and 8020. Rule 8010 identifies specific activities subject to dust control (e.g., land leveling, grading, cut and fill grading, and the erection or demolition of any structure, etc.). This rule also defines Reasonably Available Control Measures (RACM) for dust control (e.g., application of water, chemical stabilizers or other liquids, covering, paving, compacting, planting, etc.) and stipulates that stabilizers should not violate State Water Quality Control Board standards. Rule 8020 applies specifically to construction and requires that dust control shall be implemented for the duration of construction. Also, this rule states that visible dust emissions shall not exceed an opacity limit of 40% for a period or periods aggregating to more than three minutes in any 1 hour.

8.1.2 Affected Environment

This section describes the regional climate and meteorological conditions that influence transport and dispersion of air pollutants, as well as the existing air quality within the project region. The data presented in this section are representative of both the South Star I and South Star II sites.

8.1.2.1 Climatology

The climate of the southern San Joaquin Valley is characterized by hot summers, mild winters, and small amounts of precipitation that occur primarily during the late fall and winter months. The summer typically has clear skies, high temperatures, and low humidity. Little precipitation occurs during summer because migrating storm systems are blocked by a cell of high-pressure over the eastern Pacific. Occasionally, tropical air may move into the area and thunderstorms may occur over the adjacent mountains. Beginning in the fall and continuing through the winter, the storm belt and zone of strong westerly winds begins to greatly influence California. Temperature, winds, and rainfall are variable during these months, and stagnant conditions occur more frequently than during summer.

The local climate of the two South Star sites is affected by the nearby Temblor Range and associated foothills to the west. In general, the mountains produce a distinct diurnal wind pattern of northeasterly winds during the day and westerly/southwesterly drainage flow at night during the summer. During the winter months, this diurnal pattern remains; however, winter winds are more variable than during summer, due in part to winter storms and the absence of the high-pressure system that predominates during the summer. Wind speeds are generally higher in summer than in winter throughout the area. Calm conditions occur most often in winter, but are relatively infrequent during either summer or winter. Valley fog will sometimes occur during these calm, stagnant atmospheric conditions when temperature inversions trap a layer of cool, moist air near the surface.

In addition to wind flow, atmospheric stability, and mixing heights are important parameters in the determination of pollutant dispersion. Atmospheric stability is a parameter that reflects the amount of atmospheric turbulence and mixing. In general, the less stable an atmosphere, the greater the turbulence, resulting in more mixing and better pollutant dispersion. The mixing height, measured from the ground upward, is the height of the atmospheric layer in which convection and mechanical turbulence promote mixing. Good ventilation results from a high mixing height and at least moderate wind speeds within the mixing layer. In the San Joaquin Valley most days are characterized by surface-based inversions during early morning hours, resulting in very limited mixing. The average afternoon mixing height is lower in winter than summer, and mean wind speeds in the mixed layer are also relatively low during winter. Consequently, vertical mixing is less during winter than in any other season.

In the San Joaquin Valley, temperature is influenced primarily by topography with the higher elevations generally experiencing cooler temperatures. The mountains to the east, south, and west essentially block the region from the advection (the horizontal movement of air) of very cold air from the mid-continental United States in winter and the relatively cool marine air from the Pacific Ocean during summer. Very little marine air penetrates to the southern regions of the Valley.

Long-term average temperature, relative humidity, and precipitation data has been collected at Bakersfield (the closest meteorological station that collects complete data). These data are presented in Table 8.1-3. About 90% of the precipitation in the area occurs from November through April, generally in association with storms that move eastward from the Pacific Ocean. Precipitation is low because the mountains to the west and south intercept significant amounts of precipitation and produce a “rain shadow” effect. The precipitation that is received is primarily due to cold, unstable, northwesterly flow that usually follows a frontal passage. Summer precipitation is almost nonexistent except when occasional thunderstorms move over the valley, mostly affecting the eastern portions of the valley.

Relative humidity data from Bakersfield indicate that the relative humidity in summer is low to moderate, averaging 50 percent in the early morning hours, and about 23 percent during the late afternoon. As might be expected for winter months (when most of the annual precipitation occurs), humidity averages approximately 81 percent in the early morning hours to 50 to 60 percent during late afternoon.

The formation of heavy fog occurs occasionally, primarily in December and January, never in summer and seldom in spring or autumn. The number of days per year where heavy fog (visibility 0.25 mile or less) occurs is 22 days, on average. Occasionally, under stagnant meteorological conditions, a winter fog may persist for several days.

For this analysis, meteorological and air quality data were obtained from several sources. As described in the Section 8.1.4.3, meteorological data collected at Fellows in 1992 by the Westside Operators (WSO) were used to assess pollutant transport and dispersion conditions. However, because ambient temperature data were not collected at Fellows, it was necessary to use data from the National Weather Service (NWS) monitoring station in Bakersfield. (See Section 8.1.4.3 for information on how these “gaps” were filled and their relevance in the air dispersion modeling). A windrose representing the 1992 Fellows meteorological data used in the dispersion modeling is shown in Figure 8.1-1; quarterly windroses and wind frequency distribution tables are provided in Appendix B. As shown in

Figure 8.1-1, the predominant wind direction impacting Fellows is from the west-southwest; wind speeds in 1992 were generally between 1.54 and 5.14 meters per second (m/s).

8.1.2.2 Existing Air Quality

For purposes of state and federal air quality planning, the entire San Joaquin Valley Air Basin is a nonattainment area for ozone for both the federal and state AAQS. The area is considered as attainment/unclassified for NO_2; however, because NO_x and volatile organic compound (VOC) emissions are precursors to ozone formation, NO_x and VOC are regulated as nonattainment pollutants.

The Kern County portion of the San Joaquin Valley Air Basin is considered attainment /unclassified with respect to both state and federal ambient air quality standards (AAQS) for CO and SO_2. The entire air basin, including Kern County, is within an area in nonattainment for the federal state PM_{10} standards. The area has not yet been classified with respect to $PM_{2.5}$ standards.

In addition to the WSO network, ambient air quality data were collected at several locations near the South Star Project sites. There are 25 ARB monitoring stations within Kern County according to ARB's ambient air quality database (ARB, 1997). However, 8 of these stations are not actually located in the SJVAPCD and 13 stations are located in the Bakersfield metropolitan area and are not representative of the air quality conditions in western Kern County. Only 4 ARB monitoring stations are located along the Temblor Range foothills near the South Star Project site: McKittrick (ARB Site #1500240), Taft — Taft College (ARB Site #1500250), Taft — N 10th Street (ARB Site #1500213), and Maricopa (ARB Site #1500246). However, no data were available from the McKittrick and Taft — N 10th Street sites. The 17 San Luis Obispo County monitoring stations are all located near the coast and are not relevant for this analysis. Also, some of the WSO monitoring stations were not used from 1992 to 1995 and not all criteria pollutants were monitored.

Air quality data from the most recent, available and complete three years of air quality data were used to determine background air quality concentrations. For ozone and PM_{10}, three years of data for 1996 through 1998 were available from monitoring stations located in Maricopa and Taft, respectively. NO_2, CO and SO_2 levels are not measured at those locations but are available for 1997 through 1999 (and part of 2000), measured at the Bakersfield-Golden State Highway and Bakersfield-California Avenue air monitoring stations. However, due to their proximity to local traffic, the siting of the Bakersfield stations are likely to reflect much higher concentrations of those pollutants.

Air monitoring data have been collected and previously reported (Radian, 1998) for West Side Operators (WSO) air monitoring stations during 1993 through 1995. The WSO monitoring network was located along the Temblor Range in western Kern County, with three of the monitoring stations located near the proposed South Star Project sites. The locations of these stations (Fellows, McKittrick, and Maricopa) are shown in Figure 8.1-2. All stations were operated in accordance with U.S. EPA guidelines for stations collecting data in support of PSD review. Therefore, although the WSO background air quality data are older than the Bakersfield data, based on the location of the stations and considering the general unclassified/attainment status throughout Kern County for these pollutants, the older WSO air quality data are still more representative of the existing NO_2, CO and SO_2 background levels. The other (nonattainment) pollutants, ozone and PM_{10}, measured at Maricopa and Taft are more representative of the current levels in the vicinity of the proposed South Star Project.

A summary of the most recent ambient air quality data collected at the six ambient air monitoring stations for which data were available is presented in Table 8.1-4. Ozone data were collected at both the ARB and WSO stations in Maricopa. PM_{10} was measured at the ARB Taft-College station and the Westside Operator station in Fellows. CO, NO_2, and SO_2 were also measured at Fellows and NO_2 and SO_2 were measured by WSO stations in Maricopa and McKittrick, respectively. These data are considered representative of air quality at the South Star Project sites.

The ambient air quality data for O_3, PM_{10}, CO, NO_2, and SO_2 from the ARB and WSO stations are summarized in Tables 8.1-5 through 8.1-9. The data show that the federal one-hour ozone AAQS was exceeded during each year; the more stringent state ozone AAQS was exceeded much more frequently. The PM_{10} data reflect exceedances of both the federal and state 24-hour and annual average AAQS. The monitoring data indicate compliance with federal and California AAQS for CO, NO_2, and SO_2 for all averaging periods.

8.1.3 Best Available Control Technology

Federal requirements pertaining to control of pollutants subject to PSD review (i.e., attainment pollutants) were promulgated by U.S. EPA in 40 CFR 52.21 (j). This regulation defines BACT as emission limits “based on the maximum degree of reduction for each pollutant.” BACT determinations are made on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs. Federal requirements pertaining to control of nonattainment pollutants, or Lowest Achievable Emission Rate (LAER), were promulgated by U.S. EPA under 40 CFR 51.165 (a). This regulation defines LAER as the emissions limit based on either (1) the most stringent emission rate contained in a State Implementation Plan, unless the [source] demonstrates the rate is not achievable; or (2) the most stringent emissions limitation that is achieved in practice. The federal LAER does not consider the cost impacts of control.

The SJVAPCD defines BACT in Rule 2201 as the most stringent emission limit or control technology that either:

(1) Has been achieved in practice; or

(2) Is contained in a State Implementation Plan approved by U.S. EPA unless demonstrated not to be achievable; or

(3) Emission limits found by the Air Pollution Control Officer (APCO) to be feasible and cost-effective for such class or category of sources or specific source.

The primary air emission sources for the each of the South Star facilities are four parallel power generation trains. Each train consists of one natural-gas-fired aero-derivative technology combustion turbine generator (CTG) set and a non-fired heat recovery steam generator (HRSG) with a nominal rating of 25 MW (i.e., approximately 335 million British Thermal Units per hour [MMBtu/hr] heat input per unit). The criteria air pollutants to be emitted at the HRSG stacks include NO_x, CO, PM_{10}, SO_2 and VOCs. Pursuant to SJVAPCD Rule 2201, BACT is required for NO_x, VOC, PM_{10}, and SO_2 emissions that exceed 2 pounds per day and CO emissions that exceed 550 pounds per day. Given these thresholds, BACT will be required for NO_x, VOC, PM_{10}, SO_2, and CO emissions control for the South Star Project.

The BACT analysis performed for the South Star Project is provided in Appendix B. Table 8.1-10 provides a summary of the BACT analysis including the proposed control technologies and the proposed BACT emission limits.

8.1.3.1 Fugitive Dust Control

Other controls that will be implemented at each South Star site include best achievable control measures (BACM) during construction. Fugitive dust control measures stipulated by SJVAPCD Rules 8010 and 8020 include the following:

- Application of water, covering, paving, or compacting to control dust. Such control(s) will attain a control efficiency of not less than 50% (based on data available from efficiencies attained under similar conditions). No BACM used will violate State Water Quality Control Board standards.
- South Star construction activities will not cause visible dust of such opacity as to obscure an observer's view to a degree equal to or greater than an opacity of 40% for a period or periods aggregating more than three minutes in any one hour during construction.

South Star proposes to use fugitive dust suppression with water to mitigate construction related emissions. The use of chemical additives is not planned.

8.1.4 Environmental Consequences

This section describes the analyses conducted to assess the potential air quality impacts from each of the South Star facilities. Emissions estimates for construction and operation of the South Star are presented. Dispersion model selection and setup are also described (i.e., emissions scenarios and release parameters, building wake effects, meteorological data, and receptor locations) and results are presented.

8.1.4.1 Construction Emissions

The primary emission sources during construction will be heavy equipment and fugitive dust from disturbed areas at each site. A particulate matter emission factor of 0.11 tons of PM_{10} per acre per month was used to estimate fugitive dust emissions (MRI, 1996). The construction schedule calls for the following amounts of acreage to be disturbed during various construction phases:

- Months 1-3: 5.5 acres;
- Months 4-6: 2.0 acres;
- Months 7-10: 0.0 acres;
- Months 11-14: 1.0 acres; and
- Month 15: 0.0 acres.

Based on this construction schedule, the worst-case month will occur between the first and third month of construction when 5.5 acres of land are disturbed per month at each site. This results in uncontrolled emissions of approximately 0.6 tons of PM_{10} per month per site. Assuming a 50% control efficiency from frequent water applications on active construction surfaces during hours of construction (or other equivalent dust suppression measures; see Section 8.1.3.1 for details on fugitive dust control measures), the controlled worst-case construction dust emissions are estimated to be 0.3 tons/month/site. Annual average fugitive dust emissions are estimated to be approximately 0.1 tons/month/site, based on the average disturbed land acreage listed above for months 1 through 12 and assuming the same fugitive dust emission factor and control efficiency.

A second source of emissions during construction is equipment exhaust. Equipment-specific emission factors were used to estimate emissions for all criteria pollutants (U.S. EPA, 1991). Table 8.1-11 presents a list of equipment needed during construction and the estimated number of pieces of equipment that will operate during each month of construction. Emissions from equipment will occur over a 15-month construction period. Equipment activity is grouped based on the three areas of construction: the South Star Project sites (including the cogeneration plants and the onsite switchyards); transmission lines; and the interconnection at Morgan Substation.

The worst-case hourly, monthly, and annual emissions are presented in Table 8.1-12 for each site. Construction emission calculations are provided in Appendix B. Worst-case monthly emissions are based on an assumption that each piece of equipment will operate 50 hours per week (or 200 hours per month) during each month of scheduled activity. Worst-case hourly emissions were estimated by dividing worst-case monthly emissions by 200. Annual emissions were estimated by summing the monthly emissions for all equipment and determining the 12-month period having the highest emissions; emissions for this 12-

month period (i.e., month 1 through 12) were summed to get the annual emissions. An adjustment was made to the worst-case emissions based on the assumption that only 75% of the total equipment scheduled for any month will operate simultaneously.

8.1.4.2 Operational Emissions

Operational emissions from the turbines were estimated for all applicable scenarios using base emission rates and startup/shutdown emissions. The base criteria emission rates provided by the turbine vendor at 100 percent load and three ambient temperatures (15ºF, 65ºF, and 115ºF) are presented in Table 8.1-13. The combustion turbines at each facility will only operate at 100 percent load (except during startup and shutdown), therefore part load conditions were not included in the analyses. Startup and shutdown events are expected to last 15 minutes with the following quantity of emissions during that period: 5.32 pounds NOx, 40.07 pounds CO, 7.5 pounds VOCs, 1.3 pounds SO_2, and 2.25 pounds PM_{10}. It was estimated that the units will operate 16 hours per day, 6 days per week and there will be up to 313 startups and 313 shutdowns per year per turbine. However, in order to provide operations flexibility, a baseload case was also evaluated that assumed continuous operation 24 hours per day, 7 days per week with 20 startups, 20 shutdowns and approximately 3% downtime (on an annual average basis). The worst-case from these two scenarios are the basis for modeling and emission offset calculations. The emission estimates are included in Appendix B.

The annual PM_{10} emissions are based on an emission rate of 3.5 lb/hr (provided by the turbine vendor) including filterable (front-half) and condensable (back-half) particulate.

Emissions for the 1-hour scenario were estimated assuming sequential 15-minute startups for each turbines followed by normal operating loads. Similarly, emissions for the 3-, 8-, and 24-hour scenarios were estimated assuming sequential 15-minute startups for each turbine with the remaining scenario time at normal operating loads. Annual emissions were estimated for two scenarios, a 16-6 case and a 24-7 case. The 16-6 case is based on 313 startup and 313 shutdown events and at 100% load for 16 hours per day and 6 days per week (5,006 hours total including startups and shutdowns). Startups and shutdowns total approximately 156 hours per year, thus the turbines were assumed to operate at 100 percent load at 65ºF for 4,849 hours per year. The 24-7 case is based on continuous operation for 24 hours per day, 7 days per week with a 3% annual downtime and a total of 20 startups and 20 shutdowns. Annual emissions for the two South Star facilities are presented in Table 8.1-14 for both the 16-6 case and the 24-7 case. Emissions and calculations for all scenarios are contained in Appendix B.

8.1.4.3 Air Dispersion Modeling

The purpose of the air dispersion modeling analysis is to demonstrate that air emissions from each of the South Star Project facilities will not cause or contribute to an AAQS violation. The modeling addresses emissions from construction activities and routine turbine operations. The impacts from construction activities include fugitive dust and emissions associated with combustion products from diesel- and gasoline-fueled equipment. The impacts from routine turbine operations are associated with natural gas combustion. Separate modeling analyses were performed for the construction and turbine sources at because they will occur during different time periods. Each of the South Star facilities (South Star I and South Star II) were considered separately for the air quality modeling analysis. Combined emissions from both facilities were included as part of the cumulative modeling analysis described in Section 8.1.5.3. The modeling approach for assessing the air quality impacts is discussed below.

Model and Model Options. The modeling was conducted using the U.S. EPA's Industrial Source Complex (ISC) model (Version 00101) for both construction and turbine emissions (U.S. EPA, 1995a). The short-term model version, ISCST3, was used for modeling concentrations of pollutants having short-term (i.e., 1-, 3-, 8-, and 24-hour) ambient standards. The ISCST3 model is the most appropriate model because it has the ability to assess plume dispersion in flat, simple, and complex terrain, the terrain types surrounding each of the South Star Project sites. For pollutants having both short-term and annual standards (i.e., NO_2, SO_2, and PM_{10}), modeling was conducted using ISCST3 with the PERIOD option to predict impacts on the annual standard. The ISCST3 model was run with the following additional options:

- Final plume rise at all receptors;
- Stack-tip downwash;

- Buoyancy-induced dispersion;
- Calms processing;
- Missing data processing;
- Default wind profile exponents;
- Default vertical potential temperature gradients; and
- Rural dispersion coefficients.

Emission Scenarios and Release Parameters. The modeling for the South Star Project required the determination of worst-case emissions scenarios for the following averaging periods to demonstrate compliance with AAQS and PSD increments:

- 1-hour;
- 3-hour;
- 8-hour;
- 24-hour; and
- Annual.

For construction activities, it was assumed that the combustion equipment emissions will be released in the area of the construction zone within the each of the South Star Project property boundaries. As shown in Table 8.1-12, emissions associated with the construction of the transmission line and Morgan Substation are less than the emissions from the construction at either of the South Star Project sites. Emissions from the construction of the South Star switchyard are included in the emissions for the construction of each of the South Star Project sites. Accordingly, the emissions from the Project sites are modeled as the worst-case construction emissions. Due to the large amount of construction equipment needed for site construction, it was necessary to define a representative source or sources. It was assumed that the emissions will be uniformly emitted from four point sources within the construction zone. The four point sources were modeled using a 10 ft. (3.05 m) release height. PM_{10} emissions from fugitive dust were modeled using a volume source. The volume source was placed at the center of the construction area and was based on a volume having a 3.05 m vertical dimension, a 142 m lateral dimension, and a release height equal to the vertical dimension (3.05 m).

The worst-case emission scenarios were used to model the construction equipment impacts (see Table 8.1-12). For short-term scenarios, worst-case hourly emissions were used (based on worst-case hourly emissions multiplied by 75% to account for the fact that only 75% of the total equipment operating in any month will operate simultaneously). For the annual scenario, worst-case annual emissions were used (based on the sum of all worst-case monthly emissions multiplied by 75%). The emissions scenarios and release parameters for the construction activities are presented in Table 8.1-15.

For routine turbine operations, the model simulated natural gas combustion emissions from the four 80-foot stacks at each facility. An operating scenario “screening” analysis was performed for each of the Project sites to determine the worst-case operating scenarios for demonstrating compliance with the short-term ambient air quality standards (i.e. 1-hour, 3-hour, 8-hour, and 24-hour averaging periods). All base-load operating scenarios were considered in the screening analysis. The stacks were modeled as point sources at their proposed locations. Stack coordinates and base elevations for each facility are shown in Table 8.1-16. Stack release parameters are dependent on the operating scenario and are shown in Table 8.1-17. Emissions were modeled using a unit emission rate (1 g/s per turbine). The maximum modeled unit impact for each operating scenario was multiplied by the corresponding emission rate for each pollutant to determine the averaging period specific impact. The highest predicted impact from the screening analysis was then chosen as the worst-case operating scenario for the refined modeling analysis. The unit impacts, emission rates, and calculated screening impacts for South Star I and South Star II are shown in Tables 8.1-18 and 8.1-19, respectively.

The worst-case normal operating scenario identified in the screening analysis was combined with a turbine start to develop the worst-case refined modeling scenario for each pollutant and averaging period combination. Turbine startups will occur sequentially rather than simultaneously, therefore the short-term modeled emission rates will reflect a 15-minute delay between the start of the successive turbines. As an example, the first turbine starts at t=0 minutes and begins operations at 100 percent load at t=15 minutes. The second turbine then starts at t=15 minutes and begins operations at 100 percent load at t=30 minutes. Because a turbine startup exhibits reduced exhaust flow rates and temperatures, separate stack parameters were used in the refined modeling. Startup emissions are described in Section 8.1.4.2. The annual average scenario uses emissions estimates based on normal operation at 100% load at an average temperature of 65°F and includes 313 startups and 313 shutdowns per turbine. Descriptions of the worst-case refined modeling scenarios used for both facilities and the modeled emission rates and stack parameters are presented in Appendix B.

Building Wake Effects. The effect of building wakes (i.e., downwash) on the stack plumes was evaluated for the turbine emissions (downwash is not applicable to area sources, i.e., construction activities) in accordance with U.S. EPA guidance (U.S. EPA, 1985). Direction-specific building data were generated for stacks below good engineering practice (GEP) stack height using U.S. EPA's Building Profile Input Program (Version 98086 [U.S. EPA, 1995b]). Nineteen structures from the proposed South Star Project layout were included in the analysis (see Figures 8.1-3 and 8.1-4). The results of the BPIP analysis were included in the ISCST3 input files to assess downwash effects. The ISCST3 model considers direction-specific downwash using both the Huber-Snyder and Schulman-Scire algorithms as evaluated in the BPIP program. Input and output files for the BPIP analysis are included in Appendix B.

Meteorological Data. The meteorological data used in the analysis of the South Star Projects are the same as the data used in the analysis of the nearby (approximately 4.5 miles) Sunrise Project (98-AFC-4). A detailed discussion of the preparation of these data can be found in Section 8.1.4.3 of the application for 98-AFC-4. The meteorological data were preprocessed for use with ISCST3 using data obtained from various monitoring networks. Hourly surface wind speed, wind direction, and sigma theta were obtained from the WSO monitoring station at Fellows for 1992. Hourly surface temperature values were obtained from the National Weather Service (NWS) monitoring station at Bakersfield (Meadows Field). The hourly atmospheric stability (1-6) was estimated using the sigma theta data per U.S. EPA modeling guidelines. The hourly mixing height data were processed using aircraft sounding data from Bakersfield (per recommendations from SJVAPCD modeling staff). The data were preprocessed using standard U.S. EPA procedures.

Receptor Locations. Receptors were placed at off-property locations to evaluate the impacts of the South Star Project sites (see Figures 8.1-5 through 8.1-8). Receptor spacing was determined according to a receptor's distance from the property boundary. To ensure that the location of highest impact was identified, the spacing was the closest at the proposed South Star Project property boundaries; spacing increased with distance from the boundary. Receptors were placed out to 10 kilometers (km) from the property boundary. The following receptor spacing was used in the modeling analysis:

- 25-meter spacing extending from the property boundary out to 100 meters;
- 100-meter spacing within 1 km of the property boundary;
- 500-meter spacing within 1 to 5 km of the property boundary; and,
- 1,000-meter spacing within 5 to 10 km of the property boundary.

To ensure that the maximum-modeled impact was properly identified, a more detailed receptor grid at 25-meter spacing was placed around the maximum coarse-grid receptor. The receptor locations were designated using Universal Transverse Mercator (UTM) coordinates. Receptor elevations were obtained from United States Geological Survey (USGS) 7.5-minute electronic data.

8.1.4.4 Compliance with Ambient Air Quality Standards

Air dispersion modeling was performed as described in Section 8.1.4.3 to evaluate the individual impact of both the South Star I and II emissions on the applicable short-term and long-term AAQS. The impacts from construction activities and routine turbine operations were analyzed separately because they will occur during different time periods and to facilitate source culpability. In each case, the ISCST3 model predicted the maximum increases in the criteria pollutant concentrations for each averaging time at each receptor location. The maximum increases were added to the representative maximum background concentrations based on air quality data collected at the Fellows Monitoring Station for the most recent complete three years (i.e., 1993 to 1995). The impact was then compared against the most stringent state or federal AAQS. Modeled impacts from construction activities and turbine operations for South Star I and South Star II are summarized in Tables 8.1-20 and 8.1-21, respectively. Modeled impacts from the South Star Project construction activities and turbine emissions will not cause a violation of any federal or state AAQS.

South Star I

Nitrogen Dioxide Impacts. NO_2 impacts from construction and operation of South Star I are compared with the most stringent state or federal AAQS below. During the first month of construction, the model conservatively predicted 1-hour NO_2 impact of 518 $\mu g/m^3$, when combined with the existing background of 97 $\mu g/m^3$ concentration, would exceed the AAQS. The area of the modeled exceedances extends approximately 246 meters to the west of the project fenceline. The maximum modeled emission rate is approximately two times the next highest emission rate. To better approximate the remainder of the construction period, the second highest hourly emission rate was also modeled. The predicted impact of 396 $\mu g/m^3$, when combined with the background of 97 $\mu g/m^3$, is 493 $\mu g/m^3$. The AAQS is predicted by the model to be exceeded at only two locations and both lie along the facility fenceline. In order to put these modeled short-term exceedances into further perspective, it must be recognized that neither the ambient ratio method nor the ozone limiting method accurately accounts for the near-field atmospheric chemistry of the construction equipment plumes. More than 90% of the emitted NO_X is actually emitted in the form of NO, an odorless, colorless gas, with no ambient air quality standard. While the NO in the plume will oxidize to form NO_2, the criteria air pollutant, that oxidation process has very little time to occur (on the order of one or two minutes at normal wind speed) before the plume reaches near-field, fenceline receptors. Based upon published reaction times, that NO to NO_2 conversion can be considered almost negligible for near-field receptors. Based on the above, the guideline modeling techniques are considered overly conservative for near-field receptors, and no violation of the short-term NO_2 AAQS is expected during construction. Emissions during the remaining 13 months are lower, thus no exceedances of the AAQS are anticipated, even using these conservative modeling techniques during the majority of the construction period. The predicted maximum increase in the annual NO_2 is 27.0 $\mu g/m^3$. After adding the maximum annual background NO_2 of 16.6 $\mu g/m^3$, the maximum NO_2 impact is 43.6 $\mu g/m^3$. This is well below the annual NO_2 federal AAQS of 100 $\mu g/m^3$.

Turbine operation NO_2 impacts will not violate the 1-hour and annual NO_2 AAQS. The predicted maximum increase in the 1-hour NO_2 was 106 $\mu g/m^3$. After adding the maximum 1-hour background NO_2 of 97 $\mu g/m^3$, the maximum NO_2 impact was 203 $\mu g/m^3$.

This is well below the 1-hour NO_2 California AAQS of 470 $\mu g/m^3$. The predicted maximum increase in the annual NO_2 was 0.22 $\mu g/m^3$. The maximum predicted impact is based on baseload operation. After adding the maximum annual background NO_2 of 16.6 $\mu g/m^3$, the maximum NO_2 impact was 16.8 $\mu g/m^3$. This is well below the annual NO_2 federal AAQS of 100 $\mu g/m^3$.

The prediction of the modeled 1-hour NO_2 increases from construction were estimated using the EPA's Ozone Limiting Method (OLM). The background ozone values used in the OLM were obtained from the WSO station at Maricopa for 1992. The prediction of the modeled 1-hour NO_2 increases from the turbine operations assumed all emissions of NO_x were in the form NO_2. The EPA's Ambient Ratio Method (ARM) was used to estimate a more realistic impact of the South Star Project on the annual NO_2 concentrations. A U.S. EPA default factor of 0.75 was used to estimate the predicted maximum increase in the annual NO_2 concentration. The results noted above incorporate the ARM 0.75 factor. Based on CEC guidance, the ARM is not appropriate for use with the 1-hour NO_2 impacts.

Sulfur Dioxide Impacts. SO_2 impacts from construction and operation of South Star I are compared with the most stringent state or federal AAQS below. Construction SO_2 impacts will not violate the 1-hour (California), 3-hour (federal), 24-hour (California/federal), and annual (federal) SO_2 AAQS. The predicted maximum increase in the 1-hour SO_2 is 365 $\mu g/m^3$. After adding the maximum 1-hour background SO_2 of 104 $\mu g/m^3$, the maximum SO_2 impact is 469 $\mu g/m^3$. This is well below the 1-hour SO_2 California AAQS of 655 $\mu g/m^3$. The predicted maximum increase in the 3-hour SO_2 is 222 $\mu g/m^3$. After adding the maximum 3-hour background SO_2 of 57 $\mu g/m^3$, the maximum SO_2 impact is 279 $\mu g/m^3$. This is well below the 3-hour SO_2 federal AAQS of 1,300 $\mu g/m^3$. The predicted maximum increase in the 24-hour SO_2 is 28.3 $\mu g/m^3$. After adding the maximum 24-hour background SO_2 of 20 $\mu g/m^3$, the maximum SO_2 impact is 48.3 $\mu g/m^3$. This is well below the 24-hour SO_2 California AAQS of 105 $\mu g/m^3$ and the federal AAQS of 365 $\mu g/m^3$. The predicted maximum increase in the annual SO_2 is 2.97 $\mu g/m^3$. After adding the maximum annual background SO_2 of 1.8 $\mu g/m^3$, the maximum SO_2 impact 4.77 $\mu g/m^3$. This is well below the annual SO_2 federal AAQS of 80 $\mu g/m^3$.

Turbine operation SO_2 impacts will not violate the 1-hour, 3-hour, 24-hour, and annual SO_2 AAQS. The predicted maximum increase in the 1-hour SO_2 is 24.8 $\mu g/m^3$. After adding the maximum 1-hour background SO_2 of 104 $\mu g/m^3$, the maximum SO_2 impact is 129 $\mu g/m^3$. This is well below the 1-hour SO_2 California AAQS of 655 $\mu g/m^3$. The predicted maximum increase in the 3-hour SO_2 is 5.14 $\mu g/m^3$. After adding the maximum 3-hour background SO_2 of 57 $\mu g/m^3$, the maximum SO_2 impact is 62.14 $\mu g/m^3$. This is well below the 3-hour SO_2 federal AAQS of 1,300 $\mu g/m^3$. The predicted maximum increase in the 24-hour SO_2 is 0.40 $\mu g/m^3$. After adding the maximum 24-hour background SO_2 of 20 $\mu g/m^3$, the maximum SO_2 impact is 20.4 $\mu g/m^3$. This is well below the 24-hour SO_2 California AAQS of 105 $\mu g/m^3$ and the federal AAQS of 365 $\mu g/m^3$. The predicted maximum increase in the annual SO_2 is 0.04 $\mu g/m^3$ and occurs under baseload operation. After adding the maximum annual background SO_2 of 1.8 $\mu g/m^3$, the maximum SO_2 impact is 1.84 $\mu g/m^3$. This is well below the annual SO_2 federal AAQS of 80 $\mu g/m^3$.

Carbon Monoxide Impacts. CO impacts from construction and operation of South Star I are compared to the most stringent state or federal AAQS below. Construction CO impacts will not violate the 1-hour (California/federal) and 8-hour (California/federal) CO AAQS. The predicted maximum increase in the 1-hour CO is 4,180 $\mu g/m^3$. After adding the maximum 1-hour background CO of 2,941 $\mu g/m^3$, the maximum CO impact is 7,121 $\mu g/m^3$. This is well below the 1-hour CO California AAQS of 23,000 $\mu g/m^3$ and the federal AAQS of 40,000 $\mu g/m^3$. The predicted maximum increase in the 8-hour CO is 2,003 $\mu g/m^3$. After adding the maximum 8-hour background CO of 2,222 $\mu g/m^3$, the maximum CO impact is 4,225 $\mu g/m^3$. This is well below the 8-hour CO California AAQS and federal AAQS of 10,000 $\mu g/m^3$.

Turbine operation CO impacts will not violate the 1-hour and 8-hour CO AAQS. The predicted maximum increase in the 1-hour CO is 740 $\mu g/m^3$. After adding the maximum 1-hour background CO of 2,941 $\mu g/m^3$, the maximum CO impact is 3,681 $\mu g/m^3$. This is well below the 1-hour CO California AAQS of 23,000 $\mu g/m^3$ and the federal AAQS of 40,000 $\mu g/m^3$. The predicted maximum increase in the 8-hour CO is 23.8 $\mu g/m^3$. After adding the maximum 8-hour background CO of 2,222 $\mu g/m^3$, the maximum CO impact is

2,246 $\mu g/m^3$. This is below the 8-hour CO California AAQS and federal AAQS of 10,000 $\mu g/m^3$.

Particulate Matter Impacts. The proposed South Star Project lies within a designated nonattainment area for PM_{10}. Thus, the background PM_{10} concentrations already violate the (California/federal) AAQS without considering emissions from the South Star Project.

The predicted maximum increase from construction-related activities in the 24-hour PM_{10} is 55.7 $\mu g/m^3$. This exceeds the 24-hour PM_{10} California AAQS of 50 $\mu g/m^3$, but not the federal AAQS of 150 $\mu g/m^3$. The predicted maximum increase in the annual PM_{10} is 5.28 $\mu g/m^3$. This is a short-term impact that will be eliminated following the commencement of operations. PM_{10} impacts during construction will be minimized through dust control measures.

The predicted maximum increase in the 24-hour PM_{10} resulting from turbine operation is 4.03 $\mu g/m^3$. The predicted maximum increase in the annual PM_{10} is 0.48 $\mu g/m^3$. Both impacts are below their respective PSD significant impact level (SIL). PM_{10} emissions from the project will be fully offset at ratios of at least 1:1, thus no new exceedances of the state or federal standards resulting from the turbines operation are expected.

South Star II

Nitrogen Dioxide Impacts. NO_2 impacts from construction and operation of South Star II are compared with the most stringent state or federal AAQS below. During the first month of construction, the predicted 1-hour NO_2 impact, when combined with the existing background concentration, would exceed the AAQS. The area of the exceedance extends approximately 100 meters to the southwest of the project fenceline. However, as previously discussed under South Star I, the modeling technique is overly conservative and an actual AAQS violation is not expected. The maximum modeled emission rate is approximately two times the next highest emission rate. To better approximate the remainder of the construction period, the second highest hourly emission rate was modeled. The predicted impact of 350 $\mu g/m^3$, when combined with the background of 97 $\mu g/m^3$, is 447

$\mu g/m^3$, below the AAQS. The predicted maximum increase in the annual NO_2 is 27.8 $\mu g/m^3$. After adding the maximum annual background NO_2 of 16.6 $\mu g/m^3$, the maximum NO_2 impact is 44.4 $\mu g/m^3$. This is well below the annual NO_2 federal AAQS of 100 $\mu g/m^3$.

Turbine operation NO_2 impacts will not violate the 1-hour and annual NO_2 AAQS. The predicted maximum increase in the 1-hour NO_2 was 177 $\mu g/m^3$. After adding the maximum 1-hour background NO_2 of 97 $\mu g/m^3$, the maximum NO_2 impact was 274 $\mu g/m^3$. This is well below the 1-hour NO_2 California AAQS of 470 $\mu g/m^3$. The predicted maximum increase in the annual NO_2 was 0.25 $\mu g/m^3$ and occurs under baseload operations. After adding the maximum annual background NO_2 of 16.6 $\mu g/m^3$, the maximum NO_2 impact was 16.85 $\mu g/m^3$. This is well below the annual NO_2 federal AAQS of 100 $\mu g/m^3$.

The prediction of the modeled 1-hour NO_2 increases from construction were estimated using the EPA's Ozone Limiting Method (OLM). The background ozone values used in the OLM were obtained from the WSO station at Maricopa for 1992. The prediction of the modeled 1-hour NO_2 increases from the turbine operations assumed all emissions of NO_x were in the form NO_2. The EPA's Ambient Ratio Method (ARM) was used to estimate a more realistic impact of the South Star Project on the annual NO_2 concentrations. A U.S. EPA default factor of 0.75 was used to estimate the predicted maximum increase in the annual NO_2 concentration. The results noted above incorporate the ARM 0.75 factor. Based on CEC guidance, the ARM is not appropriate for use with the 1-hour NO_2 impacts.

Sulfur Dioxide Impacts. SO_2 impacts from construction and operation of South Star II are compared with the most stringent state or federal AAQS below. Construction SO_2 impacts will not violate the 1-hour (California), 3-hour (federal), 24-hour (California/federal), and annual (federal) SO_2 AAQS. The predicted maximum increase in the 1-hour SO_2 is 382 $\mu g/m^3$. After adding the maximum 1-hour background SO_2 of 104 $\mu g/m^3$, the maximum SO_2 impact is 486 $\mu g/m^3$. This is well below the 1-hour SO_2 California AAQS of 655 $\mu g/m^3$. The predicted maximum increase in the 3-hour SO_2 is 277 $\mu g/m^3$. After adding the maximum 3-hour background SO_2 of 57 $\mu g/m^3$, the maximum SO_2 impact is 334 $\mu g/m^3$. This is well below the 3-hour SO_2 federal AAQS of 1,300 $\mu g/m^3$. The predicted maximum increase in the 24-hour SO_2 is 39.0 $\mu g/m^3$. After adding the maximum 24-hour background SO_2 of 20 $\mu g/m^3$, the maximum SO_2 impact is 59.0 $\mu g/m^3$. This is well below the 24-hour SO_2 California AAQS of 105 $\mu g/m^3$ and the federal AAQS of 365 $\mu g/m^3$. The predicted maximum increase in the annual SO_2 is 3.43 $\mu g/m^3$. After adding the maximum annual background SO_2 of 1.8 $\mu g/m^3$, the maximum SO_2 impact 5.23 $\mu g/m^3$. This is well below the annual SO_2 federal AAQS of 80 $\mu g/m^3$.

Turbine operation SO_2 impacts will not violate the 1-hour, 3-hour, 24-hour, and annual SO_2 AAQS. The predicted maximum increase in the 1-hour SO_2 is 41.4 $\mu g/m^3$. After adding the maximum 1-hour background SO_2 of 104 $\mu g/m^3$, the maximum SO_2 impact is 145 $\mu g/m^3$. This is well below the 1-hour SO_2 California AAQS of 655 $\mu g/m^3$. The predicted maximum increase in the 3-hour SO_2 is 9.3 $\mu g/m^3$. After adding the maximum 3-hour background SO_2 of 57 $\mu g/m^3$, the maximum SO_2 impact is 66.3 $\mu g/m^3$. This is well below the 3-hour SO_2 federal AAQS of 1,300 $\mu g/m^3$. The predicted maximum increase in the 24-hour SO_2 is 0.71 $\mu g/m^3$. After adding the maximum 24-hour background SO_2 of 20 $\mu g/m^3$, the maximum SO_2 impact is 20.7 $\mu g/m^3$. This is well below the 24-hour SO_2 California AAQS of 105 $\mu g/m^3$ and the federal AAQS of 365 $\mu g/m^3$. The predicted maximum increase in the annual SO_2 is 0.04 $\mu g/m^3$ and occurs under baseload operations. After adding the maximum annual background SO_2 of 1.8 $\mu g/m^3$, the maximum SO_2 impact is 1.84 $\mu g/m^3$. This is well below the annual SO_2 federal AAQS of 80 $\mu g/m^3$.

Carbon Monoxide Impacts. CO impacts from construction and operation of South Star I are compared to the most stringent state or federal AAQS below. Construction CO impacts will not violate the 1-hour (California/federal) and 8-hour (California/federal) CO AAQS. The predicted maximum increase in the 1-hour CO is 4,369 $\mu g/m^3$. After adding the maximum 1-hour background CO of 2,941 $\mu g/m^3$, the maximum CO impact is 7,310 $\mu g/m^3$. This is well below the 1-hour CO California AAQS of 23,000 $\mu g/m^3$ and the federal AAQS of 40,000 $\mu g/m^3$. The predicted maximum increase in the 8-hour CO is 2,457 $\mu g/m^3$. After adding the maximum 8-hour background CO of 2,222 $\mu g/m^3$, the maximum CO impact is 4,679 $\mu g/m^3$. This is well below the 8-hour CO California AAQS and federal AAQS of 10,000 $\mu g/m^3$.

Turbine operation CO impacts will not violate the 1-hour and 8-hour CO AAQS. The predicted maximum increase in the 1-hour CO is 1,242 $\mu g/m^3$. After adding the maximum 1-hour background CO of 2,941 $\mu g/m^3$, the maximum CO impact is 4,183 $\mu g/m^3$. This is well below the 1-hour CO California AAQS of 23,000 $\mu g/m^3$ and the federal AAQS of 40,000 $\mu g/m^3$. The predicted maximum increase in the 8-hour CO is 41.2 $\mu g/m^3$. After adding the maximum 8-hour background CO of 2,222 $\mu g/m^3$, the maximum CO impact is 2,263 $\mu g/m^3$. This is below the 8-hour CO California AAQS and federal AAQS of 10,000 $\mu g/m^3$.

Particulate Matter Impacts. The proposed South Star I lies within a designated nonattainment area for PM_{10}. Thus, the background PM_{10} concentrations already violate the (California/federal) AAQS without considering emissions from South Star I.

The predicted maximum increase from construction-related activities in the 24-hour PM_{10} is 47.2 $\mu g/m^3$. This is below the 24-hour PM_{10} California AAQS of 50 $\mu g/m^3$. The predicted maximum increase in the annual PM_{10} is 5.13 $\mu g/m^3$. This is a short-term impact that will be eliminated following the commencement of operations. PM_{10} impacts during construction will be minimized through dust control measures.

The predicted maximum increase in the 24-hour PM_{10} resulting from turbine operation is 7.0 $\mu g/m^3$. The predicted maximum increase in the annual PM_{10} is 0.55 $\mu g/m^3$ and occurs under baseload operations. This is below the PSD SIL for annual PM_{10}. PM_{10} emissions from the project will be fully offset at ratios of at least 1:1, thus no new exceedances of the state or federal standards resulting from the turbines operation are expected.

Impacts for Nonattainment Pollutants and their Precursors. The emission offset program in the SJVAPCD was developed to facilitate net air quality improvement. South Star Project impacts for the nonattainment pollutants (PM_{10} and ozone) and their precursors (NO_x, VOC, and SO_2) will be mitigated by emission offsets. The offsets have not been accounted for in the modeled impacts noted above. Thus, the South Star Projects' modeled impacts significantly overestimate actual project impacts because they do not account for the effect of removing future PM_{10}, NO_x, VOC, and SO_2 from the Western Kern County air shed.

8.1.5 Commissioning Activities

Initial start-up and commissioning for the South Star Project combustion turbine generators is estimated to occur over a 4-6 week duration from first fire to full load commercial operation. As a worst case scenario, the South Star project will perform initial start-up on a maximum of two units in parallel during any one hour. In reality, however, each pair of combustion turbine generators will need to be commissioned on a slightly staggered schedule to best utilize on-site personnel and resources.

The combustion turbine generators will be commissioned and tested based on the following activities associated with running the gas turbine. The scheduled duration listed below is for each Gas Turbine Generator unit.

Commissioning Activity	Calendar Duration[1]	Unit Load
No Load Runs	3 days	60%-100%
Dry Low Emissions (DLE) Combustor Tuning	2 days	60%-100%
HRSG Clean-out	2 days	60%
Install Catalyst	5 days	N/A
Turbine Wash	1 day	60%
Generator Testing	4 days	25%-100%

[1]Each calendar day is 8 hours

Once the pre-commissioning steps have been completed, each gas turbine will be tested by performing a no load run. There may be several CTG starts associated with these runs. The turbine will also be started and will run during the sweep of the HRSG prior to installing catalyst. This run will be approximately four hours for each of the four units. During final commissioning, generator testing will be performed at various load conditions.

The owner will minimize emissions of CO, NO_x, and other pollutants by limiting the test time of each commissioning activity to the shortest duration feasible. The NO_x and

CO catalyst will be installed at the earliest possible time in the testing cycle consistent with manufacturer's recommendations.

Types of testing and duration of tests:

The owner/operator will submit a plan to the SJVAPCD Compliance Division and the CEC at least 2 weeks prior to first firing of the gas turbines. The plan will include a description of each commissioning activity, the anticipated duration of said activity, and the purpose of the activity. The testing activities are listed below:

- Four pre-commissioning start-ups with short duration run time - 4 hours each, 16 hours per CTG.
- HRSG clean-out - Approximately 4 hours per CTG, 16 hours total for four units.
- Generator testing - 4 hours per CTG, 16 hours total for four units.
- Turbine wash – 2 hour per CTG, 8 hours total for four units.

Emissions Monitoring:

Prior to initial start-up of each combustion turbine generator, a continuous emissions monitoring (CEM) system will be installed, tested, and calibrated to measure criteria pollutants during start-up and commissioning.

The CEM will provide monitoring and recording on 15-minute averages of fuel flow rates, firing hours, stack gas NO_x, stack gas CO, and stack gas O_2 concentrations. The owner/operator shall use District approved methods to calculate heat input rates, mass emissions and concentrations of criteria pollutant emissions. The CEM type, specifications, and stack location will be in accordance with the District requirements.

The total number of hours that each combustion turbines generator will fire without NO_x and CO abatement will not exceed 300 hours during the commissioning period. The operation of the gas turbine and HRSG without abatement shall be limited to those commissioning activities whereby the SCR and CO catalyst must not be installed.

The total mass emissions of NO_x, CO, precursor organic compounds, PM10 and SO2 that are emitted during the commissioning period shall accrue towards the consecutive 12 month emission limitations specified in the permit application.

Prior to the end of the commissioning period, the owner/operator shall conduct a District approved source test using external continuous emission monitors to determine compliance of the emission limits specified during commissioning. The source test shall determine NO_x, CO, VOC emissions during start-up and shutdown of the gas turbines. The VOC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas (UHC). The source test shall include a minimum of three start-up and three shutdown periods. Twenty calendar days before the execution of the source tests, the owner/operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this condition. The District and the CEC CPM will notify the owner/operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The owner/operator shall notify the District and the CEC CPM within the seven (7) working days prior to the planned source testing date. Source test results shall be submitted to the District and the CEC CPM within 30 days of the source testing date.

Results of a commissioning modeling analysis are presented in Table 8.1-22. The analysis is based on each CTG being commissioned at a time, with short-term emission estimates that reflect higher commissioning emissions (i.e., maximum of two units at the highest emission rates during any given hour). These estimates are not precise, since actual commissioning data from RB-211 CTGs are not available. The analysis was only performed for short-term averaging times, 24 hours or less.

8.1.6 Potential Indirect and Cumulative Impacts

Since the South Star Project will sell cogenerated steam to a third party (TCI) for purposes of thermal enhanced oil recovery of crude oil, it is necessary to examine the (indirect) affects associated with the thermal recovery of steam by TCI. Cumulative impacts of past, present, and reasonably foreseeable future projects must be considered with related environmental impacts. These potential indirect and cumulative impacts are discussed below, along with presentation of cumulative air quality impacts.

All activities associated with oil production activities are separately regulated under CEQA and by Division of Oil, Gas and Geothermal Resources and/or San Joaquin Valley APCD. TCI must obtain the requisite permits prior to engaging in any future oilfield development activity. Mitigation would be required for any significant impacts during the permitting process. Therefore, there are no indirect air quality impacts associated with South Star.

8.1.6.1 Potential For Cumulative Impacts

In Kern County, projects with related environmental impacts may include other cogeneration projects and other power projects. Most of the existing power projects are less than 50 MW but the County also includes two 300 MW cogeneration plants in the Kern River oilfield and the 225 MW Midway-Sunset cogeneration plant in the Midway Sunset oil field. In addition to these existing projects, are the 1,000 MW La Paloma Project to be located near McKittrick, approximately 10 miles north of South Star II, the 320 MW Sunrise Project, approximately 4.5 miles northeast of South Star II, and the proposed 500 MW Elk Hills Project. SJVAPCD has also indicated that the < 50 MW the Hanover L.P. facility is located within 6 miles of the South Star sites. The Elk Hills Project is located approximately 9.6 miles north of the South Star II.

8.1.6.2 Cumulative Impacts Modeling

California Energy Commission requirements specify that an analysis may be required to determine the cumulative impacts of the South Star Project and other projects within a 6-mile radius that have received construction permits but are not yet operational or that are in the permitting process. The cumulative impact analysis will assess whether estimated emissions concentrations may cause or contribute to a violation of any ambient air quality standard. As part of the expedited permitting process, a cumulative analysis of the emissions of the South Star Project and of surrounding projects was performed.

Detailed data from SJVAPCD's permit files for the appropriate facilities was used to model the impacts associated with the La Paloma Generating Project, Elk Hills Power

Plant, Western Midway-Sunset, Sunrise, and Hanover L.P. facilities. The La Paloma and Elk Hills Projects are located further than 6 miles from South Star II (the northern most South Star facility) but were included because they are two of the larger facilities in the area. The facilities modeled in the cumulative analysis are shown in Figure 8.1-9. Impacts were modeled using the ISCST3 model. The model was executed with 1992 Fellows meteorology and the options identified in Section 8.1.4.3 for project modeling. The South Star I and South Star II facilities were modeled as separate groups in order to isolate and compare the individual facility impacts relative to the other facilities' impacts. For all sources included in the cumulative modeling, the typical operating modes were assessed. Stack parameters and emission rates are summarized in Tables 8.1-23 and 8.1-24, respectively. Detailed emission calculations for neighboring sources were based on the maximum permitted emission rates for the various pollutant and averaging period combinations. Emission calculations are provided in Appendix B. Sources such as cooling towers and internal combustion driven sources were not included in the cumulative modeling analysis. The maximum impact for these types of sources typically occur near the facility fenceline and are not apt to contribute to the cumulative impact.

The results of the cumulative analysis are presented in Table 8.1-25. There are no applicable thresholds for comparison, thus the results presented in Table 8.1-25 are for informational purposes only.

8.1.7 Emission Offsets and Project Mitigation Techniques

Both California and federal laws require major sources of nonattainment pollutants in nonattainment areas to mitigate their air quality impacts by providing emission offsets. These offset requirements are implemented under SJVAPCD Rule 2201.

Table 8.1-26 summarizes the offset requirements specified by Rule 2201 that are applicable to the South Star Project. For purposes of SJVAPCD New Source Review, each South Star site is considered a separate stationary source. As shown in Table 8.1-26, the South Star Project will trigger Rule 2201 offset requirements for NO_x, VOC, and PM_{10}. Although the SJVAPCD SO_2 emission offset threshold will not be exceeded by either South Star site, the South Star project will be located in an air basin that is currently considered nonattainment for PM_{10}.Since SO_2 is considered a precursor to PM_{10}, South Star will offset primary SO_2 emissions at a ratio of 1:1 to mitigate for possible secondary particulate formation. Although CO emissions will also exceed the applicable offset threshold, Rule 2201 Section 4.2.1.1 exempts the South Star Project from offset requirements because the air quality modeling contained in Section 8.1.4 shows that the South Star Project will not cause or contribute to a violation of any applicable California or federal AAQS.

In addition to the proposed SO_2 emission offsets indicated in Table 8.1-26, the South Star Project will be subject to the Clean Air Act Title IV provisions that will require the South Star Project to hold annual SO_2 allowances for each ton of SO_2 emitted after 2000. The total quantity of required annual SO_2 allowances will be very small. SO_2 allowances are available through emissions brokers and through annual U.S. EPA auctions. Sufficient allowances will be acquired by South Star prior to commencement of operation in accordance with Title IV requirements.

8.1.7.1 Emission Offset Supply

The SJVAPCD maintains a formal ERC banking system pursuant to Rules 2301 and 2302. For an ERC to be deposited in the bank, the depositor must demonstrate that the ERCs meet applicable federal Emission Trading Policy criteria (i.e., ERCs are real, federally enforceable, quantifiable, verifiable, and surplus). All ERCs currently in the bank that were deposited after the date of adoption of Rules 2201, 2301, and 2302 can, therefore, be assumed to comply with applicable federal emissions trading criteria. It is the intention of the South Star Project to use only ERCs that satisfy these federal emissions trading criteria.

The South Star Project has initiated negotiations with ERC holders in Western and Central Kern County that meet the stated ERC criteria and can supply all of the ERCs needed for the South Star Project. The majority of the offsets being proposed for the South Star Project were created by either: over-control of existing oilfield steam generators; or conversion of existing steam generators from oil to natural gas firing.

A comparison of the South Star Project offset requirements and the ERCs under consideration is shown in Table 8.1-27. Additional ERC information will be submitted under confidential cover. Rule 2201 requires that ERCs located within 15 miles must be provided at a ratio of 1.3 to 1. ERCs located outside of 15 miles must be provided at a ratio of 1.5 to 1. Project ERC requirements for both ratios are shown in Table 8.1-27.

Because of the low quantity of PM_{10} ERCs available, it is proposed that South Star offset PM_{10} emissions using SO_2 ERCs at an interpollutant offset ratio of 1.5:1. Justification for this ratio is currently being finalized and will be submitted to both the SJVAPCD and the CEC.

The South Star Project expects to complete its offset negotiations within the third quarter of 2001.

8.1.8 Compliance with Laws, Ordinances, Regulations, and Standards

All applicable LORS are summarized in Table 8.1-29 along with the administering agency. This section presents the applicable air quality permits or approvals required for the South Star Project (Table 8.1-28) and describes how the South Star Project will comply with all applicable air quality LORS (Table 8.1-29). It should be noted that in order to demonstrate compliance with several LORS, the South Star Project will install and operate a continuous emissions monitoring (CEM) system. The CEM system is described in detail in Section 2.2.9 of this AFC.

In summary, the South Star Project will comply with all applicable LORS, conform to BACT requirements, and will not interfere with attainment or maintenance of California and federal AAQS. In addition, the South Star Project emissions (NO_x, VOCs, PM_{10}, and CO) will be fully offset.

8.1.9 Proposed Conditions of Certification

In order to ensure compliance with applicable LORS and/or to reduce potentially significant impacts to less than significant levels, proposed conditions of certification are contained in Appendix K.

8.1.10 Agency Contacts

The air quality agencies having authority over construction and operation of the South Star Project are shown below:

Agency	Contact/Title	Telephone
San Joaquin Valley Air Pollution Control District	Tom Goff, P.E./ Permit Services Manager Southern Zone 2700 “M” Street, Suite 275 Bakersfield, CA 93301	(661) 326-6900

8.1.11 References

ARB, 1997. California Ambient Air Quality Data, 1980-1996 CD-ROM, CD Number TSD-97-008-CD, Air Quality Data Branch, California Air Resources Board, Sacramento, California. December.

BAAQMD, 1992. Personal communication with Brenda Cabral, Bay Area Air Quality Management District, December 2.

Black & Veatch, 1998. Memo from R.L. Lansman and S.M. Clark, Black & Veatch, to Julie Way, Texaco Global Gas & Power. September.

Calpine, 1997. *Application for Certification for Sutter Power Plant Project*, Volume I, Calpine Corporation. December.

ESC, 1998. Air quality and meteorology data for Westside Operators Network (January 1, 1989 through September 30, 1995). Environmental Systems Corporation. Knoxville, Tennessee. September.

La Paloma Generating Company, LLC, 1998. *Application for Certification*. July.

NCDC, 1998. National Climatic Data Center. Climatological data — Bakersfield, California, 1998. (http://www.ncdc.noaa.gov/01/climate/online/ccd/)

Procter, 1998. Personal communication with Trent Procter, USFS, Sequoia National Forest, November 17.

Radian, 1998. Modeling Protocol for the Sunrise Cogeneration and Power Project, Kern County, California. Prepared by Radian International for Texaco Global Gas Power. October.

U.S. EPA, 1985. Guideline for Determination of Good Engineering Stack Height (Technical Support Document for the Stack Height Regulation) (Revised), EPA-450/4-80-023R. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. June.

U.S. EPA, 1990. New Source Review Workshop Manual Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. October.

U.S. EPA, 1991. Nonroad Engine and Vehicle Emission Study — Report, 21A-2001, Office of Mobile Sources, U.S. Environmental Protection Agency, Washington, D.C. 20460. November.

U.S. EPA, 1992. Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023, Office of Air and Radiation, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. October.

U.S. EPA, 1995a. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, EPA-454/B-95-003a, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. September.

U.S. EPA, 1995b. User's Guide to the Building Profile Input Program (Revised), EPA-454/R-93-038, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. February.

U.S. Forest Service, 1992. Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in California, General Technical Report PSW-GTR-136. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, Albany, California. November.

Table 8.1-1. Relevant Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	California AAQS[a,c]	Federal AAQS[b,c] Primary	Federal AAQS[b,c] Secondary
Ozone (O_3)	1-hour	0.09 ppm (180 µg/m^3)	0.12 ppm (235 µg/m^3)	Same as primary standard
	8-hour[d]		0.08 ppm (157 µg/m^3)	
Carbon Monoxide (CO)	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	
Nitrogen Dioxide (NO_2)[e]	Annual (Arithmetic Mean)		0.053 ppm (100 µg/m^3)	Same as primary standard
	1-hour	0.25 ppm (470 µg/m^3)		
Sulfur Dioxide (SO_2)	Annual (Arithmetic Mean)		0.03 ppm (80 µg/m^3)	
	24-hour	0.04 ppm[f] (105 µg/m^3)	0.14 ppm (365 µg/m^3)	
	3-hour			0.05 ppm (1300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)		
Respirable Particulate Matter (PM_{10})	Annual (Geometric Mean)	30 µg/m^3		Same as primary standard
	24-hour	50 µg/m^3	150 µg/m^3	
	Annual (Arithmetic Mean)		50 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$)[d]	24-hour	No separate State standard	65 µg/m^3	Same as primary standard
	Annual (Arithmetic Mean)		15 µg/m^3	
Visibility Reducing Particles	1 observation	See footnote "g"	No federal standard	No federal standard

a. Title 17, California Code of Regulations, California AAQS for ozone (as volatile organic compounds), carbon monoxide, sulfur dioxide (1-hour), nitrogen dioxide, and particulate matter (PM_{10}), are values that are not to be exceeded. The visibility standard is not to be equaled or exceeded.

b. 40 CFR 50. National AAQS, other than those for ozone and based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

c. Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25° C and a reference pressure of 760 mm of mercury. All measurements of air quality area to be corrected to a reference temperature of 25° C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d. New federal 8-hour ozone and fine particulate matter ($PM_{2.5}$) standards were promulgated by U.S. EPA on July 18, 1997. The federal 1-hour ozone standard continues to apply in areas that violated the standard.

e. Nitrogen dioxide (NO_2) is the compound regulated as a criteria pollutant; however, emissions are usually based on the sum of all oxides of nitrogen (NO_x).

f. At locations where the state standards for ozone and/or PM_{10} are violated. National standards apply elsewhere.

g. In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less that 70%. "Prevailing visibility" is defined as the greatest visibility, which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

AAQS = Ambient Air Quality Standard
mg/m^3 = milligrams per cubic meter
µg/m^3 = micrograms per cubic meter

Table 8.1-2. Federal and State Attainment Status for Western Kern County

Pollutant	Federal Attainment Status	State Attainment Status
Ozone	Nonattainment/Serious	Nonattainment/Severe
CO	Unclassified/Attainment	Attainment
NO_2	Unclassified/Attainment	Attainment
SO_2	Attainment	Attainment
PM_{10}	Nonattainment/Serious	Nonattainment
Lead	Unclassifiable/Attainment	Attainment

Table 8.1-3. Temperature, Relative Humidity, and Precipitation Data for Bakersfield, California

	Average Daily Temperature (°F)		Relative Humidity (%)		Average
Month	Minimum	Maximum	Morning	Afternoon	Precipitation (inches)
January	38.6	56.9	83	63	0.86
February	42.6	63.9	78	51	1.06
March	45.8	68.9	72	44	1.04
April	50.1	75.9	65	33	0.57
May	57.3	84.6	55	26	0.20
June	64.0	92.4	50	23	0.10
July	69.6	98.5	48	22	0.01
August	68.5	96.6	53	24	0.09
September	63.5	90.1	57	28	0.17
October	54.8	80.7	63	33	0.29
November	44.7	66.8	76	49	0.70
December	38.3	56.5	83	62	0.63
Annual Average	**53.2**	**77.7**	**65**	**38**	**5.72**

Source: NCDC, 1998.

Table 8.1-4. Ambient Air Quality Data from ARB and Westside Operators Monitoring Stations

Location	Operator	Ozone	PM_{10}	CO	NO_2	SO_2	Years
Taft – College	ARB		**X**				1996-1998
Maricopa	ARB	**X**					1996-1998
McKittrick	WSO					X	1993-1995[a]
Fellows	WSO		**X**	**X**	**X**	**X**	1993-1995[a]
Maricopa	WSO	X			X		1993-1995[a]
Bakersfield – Golden State	ARB	X	X	X	X		1997-1999
Bakersfield – California Ave.	ARB	X	X	X	X	X	1997-1999

a = Data from the Westside Operators monitoring stations was only available through September 30, 1995.
X = Data were available for this pollutant at this location. **X** (bold font) = Most representative.

Table 8.1-5. Summary of Ambient Data for Ozone

	Maximum 1-Hour Average Concentration ($\mu g/m^3$)[a,b]			Maximum 8-Hour Average Concentration ($\mu g/m^3$)		
	1996	**1997**	**1998**	**1996**	**1997**	**1998**
Taft – College (ARB)	—	—	—	—	—	—
Maricopa (ARB)	237	227	280	225	204	263
	1993	**1994**	**1995[c]**	**1993**	**1994**	**1995**
McKittrick (WSO)	—	—	—	—	—	—
Fellows (WSO)	—	—	—	—	—	—
Maricopa (WSO)	255	255	255	—	—	—
	1997	**1998**	**1999**	**1997**	**1998**	**1999**
Bakersfield – Golden State	229	259	231	204	218	194
Bakersfield – California Ave	235	243	227	214	216	198

[a]1-hr average concentrations exceed the state ozone ambient air quality standard of 0.09 ppm (180 $\mu g/m^3$).

[b]1-hr average concentrations exceed the federal ozone ambient air quality standard of 0.12 ppm (235 $\mu g/m^3$).

[c] WSO Monitoring data for 1995 are only available from January 1 to September 30.

— = Data not available.
ARB = California Air Resources Board
$\mu g/m^3$ = micrograms per cubic meter
ppmv = parts per million volume
WSO = Westside Operators

Table 8.1-6. Summary of Ambient Data for PM_{10}

	Maximum 24-Hour Average Concentration ($\mu g/m^3$)[a]			Annual Average Concentration - Geometric and Arithmetic ($\mu g/m^3$)		
	1996	**1997**	**1998**	**1996**	**1997**	**1998**
Taft – College (ARB)	94	78	84	28.4 34.4	27.6 30.9	— 29
Maricopa (ARB)	—	—	—	—	—	—
	1993	**1994**	**1995[e]**	**1993**	**1994**	**1995[e]**
McKittrick (WSO)	—	—	—	—	—	—
Fellows (WSO)	109	85	80	31.0 [c] 39.8	25.9 30.2	24.6 31.7
Maricopa (WSO)	—	—	—	—	—	—
	1997	**1998**	**1999**	**1997**	**1998**	**1999**
Bakersfield – Golden State	124	159[b]	183	— 46.5	— 68.9 [d]	50.3 [c] 59.5[d]
Bakersfield – California Ave	137	148	143	38.4 [c] 41.9	31.9 [c] 37.5	40.3 [c] 47.4

[a] 24-hr average concentrations exceed the state PM_{10} ambient air quality standard of 50 $\mu g/m^3$.

[b] 24-hr average concentration exceeds the federal PM_{10} ambient air quality standard of 150 $\mu g/m^3$.

[c] Annual geometric concentration exceeds the state PM_{10} ambient air quality standard of 30 $\mu g/m^3$.

[d] Annual geometric concentration exceeds the federal PM_{10} ambient air quality standard of 50 $\mu g/m^3$.

[e] WSO Monitoring data for 1995 are only available from January 1 to September 30.

— = Data not available.
ARB = California Air Resources Board
$\mu g/m^3$ = micrograms per cubic meter
ppmv = parts per million volume
WSO = Westside Operators

Table 8.1-7. Summary of Ambient Data for Carbon Monoxide (CO)

	Maximum 1-Hour Average Concentration (mg/m³)[a,b]			Maximum 8-Hour Average Concentration (mg/m³)[c]		
	1996	**1997**	**1998**	**1996**	**1997**	**1998**
Taft – College (ARB)	—	—	—	—	—	—
Maricopa (ARB)	—	—	—	—	—	—
	1993	**1994**	**1995[d]**	**1993**	**1994**	**1995[d]**
McKittrick (WSO)	—	—	—	—	—	—
Fellows (WSO)	2.941	2.303	2.440	2.222	1.985	1.870
Maricopa (WSO)	—	—	—	—	—	—
	1997	**1998**	**1999**	**1997**	**1998**	**1999**
Bakersfield – Golden State	8.778	11.628	6.156	4.834	9.006	5.700
Bakersfield – California Ave	5.928	6.498	6.612	4.571	4.446	5.141

[a]All 1-hr concentrations are below the federal CO ambient air quality standard of 35 ppmv (40 mg/m^3).
[b]All 1-hr concentrations are below the California CO ambient air quality standard of 20 ppmv (23 mg/m^3).
[c]All 8-hr concentrations are below the federal and California CO ambient air quality standard of 9 ppmv (10 mg/m^3).
[d] WSO Monitoring data for 1995 are only available from January 1 to September 30.

— = Data not available.
ARB = California Air Resources Board
µg/m^3 = micrograms per cubic meter
ppmv = parts per million volume
WSO = Westside Operators

Table 8.1-8 Summary of Ambient Data for Nitrogen Dioxide (NO_2)

	Maximum 1-Hour Concentration (µg/m3)[a]			Annual Average Concentration (µg/m^3)[b]		
	1996	**1997**	**1998**	**1996**	**1997**	**1998**
Taft – College (ARB)	—	—	—	—	—	—
Maricopa (ARB)	—	—	—	—	—	—
	1993	**1994**	**1995[c]**	**1993**	**1994**	**1995[c]**
McKittrick (WSO)	—	—	—	—	—	—
Fellows (WSO)	92	94	62	16.6	14.4	12.6
Maricopa (WSO)	81	81	97	15.6	16.3	13.6
	1997	**1998**	**1999**	**1997**	**1998**	**1999**
Bakersfield – Golden State	142.9	182.4	176.7	45.9	44.8	50.8
Bakersfield – California Ave	152.3	157.9	201.2	41.3	41.7	47

[a]All 1-hr concentrations are below the California NO_2 ambient air quality standard of 0.25 ppm (470 µg/m^3).
[b]All annual averaged concentrations are below the federal ambient air quality standard of 0.053 ppm (100 µg/m^3).
[c] WSO Monitoring data for 1995 are only available from January 1 to September 30.

— = Data not available.
ARB = California Air Resources Board
µg/m^3 = micrograms per cubic meter
ppmv = parts per million volume
WSO = Westside Operators

Table 8.1-9. Summary of Ambient Data for Sulfur Dioxide (SO_2)[a]

	Maximum 1-Hour Average Concentration (µg/m³)[a]			Maximum 3-Hour Average Concentration (µg/m³)[d]			Maximum 24-Hour Average Concentration (µg/m³)[b,c]			Annual Average Concentration (µg/m³)[e]		
	1996	**1997**	**1998**	**1996**	**1997**	**1998**	**1996**	**1997**	**1998**	**1996**	**1997**	**1998**
Taft – College (ARB)	—	—	—	—	—	—	—	—	—	—	—	—
Maricopa (ARB)	—	—	—	—	—	—	—	—	—	—	—	—
	1993	**1994**	**1995[f]**	**1993**	**1994**	**1995[f]**	**1993**	**1994**	**1995[f]**	**1993**	**1994**	**1995[f]**
McKittrick (WSO)	26	49	104	20	35	53	6	17	10	0.4	1.4	0.7
Fellows (WSO)	36	94	65	27	57	36	14	20	13	1.8	1.8	1.5
Maricopa (WSO)	—	—	—	—	—	—	—	—	—	—	—	—
	1997	**1998**	**1999**	**1997**	**1998**	**1999**	**1997**	**1998**	**1999**	**1997**	**1998**	**1999**
Bakersfield – Golden State (ARB)	—	—	—	—	—	—	—	—	—	—	—	—
Bakersfield – California Ave (ARB)	28.7	—	28.7	—	—	—	10.4	—	15.7	5.2	—	7.8

[a]All 1-hr, 24-hr and annual average SO_2 concentrations are below the state ambient air quality standard of 0.25 ppm (655 µg/m³).

[b]All 24-hr SO_2 concentrations are below the state ambient air quality standard of 0.04 ppm (105 µg/m³).

[c]All 24-hr SO_2 concentrations are below the federal ambient air quality standard of 0.14 ppm (365 µg/m³).

[d]All 3-hr concentrations are below the federal ambient air quality standard of 0.5 ppm (1,300 µg/m³).

[e]All annual average SO_2 concentrations are below the federal ambient air quality standard of 0.030 ppm (80 µg/m³).

[f]WSO Monitoring data for 1995 are only available from January 1 to September 30.

— = Data not available.
ARB = California Air Resources Board
µg/m³ = micrograms per cubic meter
ppmv = parts per million volume
WSO = Westside Operators

Table 8.1-10. Summary of South Star Project BACT

Pollutant	Control Technology	Concentration ppm @ 15% O_2 dry[1]
NO_x	Dry low NO_x combustors and SCR with ammonia injection	2.0
CO	CO Oxidation Catalyst	4
VOC	Effective combustion	2 ppmv, dry[2]
SO_x	Pipeline quality natural gas	<1[3]
PM_{10}	Pipeline quality natural gas	< 0.01 gr/dscf

1 Unless otherwise noted
2 Actual stack conditions
3 BACT is the use of low sulfur fuel. The CTG supplier's guaranteed "not to exceed" value is 2.5 ppmv at actual stack conditions. In California, the CARB has calculated the use of low sulfur natural gas to result in a stack concentration of less than 1.0 ppmvd @ a5% O_2.T=

Table 8.1-11. Estimated Construction Equipment and Schedule

Equipment Classification	Equipment Type	Fuel	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Main Site (Quantities are per site.)																	
Compressors	Air Compressor (750CFM)	Diesel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Air Compressors (185CFM)	Diesel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Air Receiver	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Air Receiver	N/A					X	X	X	X	X	X	X	X	X	X	
Excavating	Crawler Excavator Cat	Diesel	X	X													
	Crawler Backhoe Cat 330 Track	Diesel		X	X												
	Backhoe 1.0 Cy	Diesel			X	X	X	X	X	X	X						
	Loader-Front-end 2 cyd	Diesel	X	X	X	X	X	X	X	X	X						
	Loader-Front-end 3 cyd	Diesel	X	X													
	Loader-Front-end 3cyd	Diesel	X	X													
	Loader-Front-end 3cyd	Diesel	X	X													
	Dozer Cat/D8	Diesel	X	X											X	X	
	Dozer Cat/D8	Diesel	X	X											X	X	
	Dozer Cat/D8	Diesel	X	X											X	X	
	Dozer Cat/D8	Diesel	X	X											X	X	
	Grader	Diesel	X	X											X	X	
	Grader	Diesel	X	X													
	Sheepsfoot Compactor	Diesel	X	X													
	Boring Vehicle	Diesel	X	X													
Hoists/	Skyclimbers	N/A						X	X	X				X	X	X	
Elevators	Scissor Lift	Diesel						X	X	X	X	X	X	X			
	Forklift	Diesel			X	X	X	X	X	X	X	X	X	X	X	X	
Cranes	4100W	Diesel						X	X	X	X			X	X	X	
	110 Ton	Diesel									X	X	X	X			
Hydraulic Cranes	55 Ton	Diesel						X	X	X	X	X	X	X	X	X	

Table 8.1-11. (Continued)

Equipment Classification	Equipment Type	Fuel	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Main Site (Quantities are <u>per site</u>.)																	
Misc.	Cable Pulling Equip	Diesel					X	X	X	X	X	X	X	X	X		
	Pickup Trucks (Proj. Manager)	Gas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Pickup Trucks (Const. Manager)	Gas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Pickup Trucks (Admin Manager)	Gas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Pickup Trucks (Civil Super.)	Gas	X	X	X	X	X	X	X	X	X	X					
	Pickup Trucks (Boiler Super.)	Gas					X	X	X	X	X	X	X	X			
	Pickup Trucks (Mech. Super.)	Gas					X	X	X	X	X	X	X	X	X	X	
	Pickup Trucks (Piping Super.)	Gas		X	X	X	X	X	X	X	X	X	X	X	X	X	
	Pickup Truck	Gas	X	X	X	X	X	X	X	X	X						
	Pickup Truck	Gas	X	X	X	X	X	X	X	X	X						
	Pickup Truck	Gas	X	X	X	X	X	X	X								
Generators	7000 W Portable	Gas	X	X	X	X	X	X									
	7000 W Portable	Gas	X	X	X	X	X	X									
	7000 W Portable	Gas				X	X	X	X	X							
	7000 W Portable	Gas						X	X	X	X						
Portable Welders	Welder 300 Amp	Diesel						X	X	X	X	X	X	X	X	X	X
	Welder 300 Amp	Diesel						X	X	X	X	X	X	X	X	X	X
	Welder 300 Amp	Diesel			X	X	X	X	X	X	X						
	Welder 300 Amp	Diesel			X	X	X	X	X	X	X						
Earthwork	Compactor; roller	Diesel	X	X												X	X
	Compactor; roller	Diesel	X	X												X	X
	Scraper	Diesel	X	X													
	Bulldozer Cat/D8	Diesel	X	X													
Trucks	Heavy Haul/Tractors & Trailers	Diesel					X	X					X	X			
	25 Dump Trucks 8-10 cy each	Diesel	X	X													
	Dump Truck, 6 cy	Diesel			X	X										X	X
	Dump Truck, 6 cy	Diesel			X	X										X	X
	Water Truck	Diesel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Water Truck	Diesel	X	X													

Table 8.1-11. (Continued)

Equipment Classification	Equipment Type	Fuel	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Main Site (Quantities are <u>per site</u>.)																	
	Heavy Equipment Delivery Truck	Diesel						X	X				X	X			
	Concrete Delivery Truck	Diesel		X	X	X	X	X									
	Bucket Truck	Diesel						X	X							X	X
Transmission Line (Total for Both Sites)																	
Compressors	ICE/Air Compressor	Diesel	X	X	X												
Excavating	Boring Vehicle	Diesel	X	X	X												
	Loader-Front-end 3 cyd	Diesel	X	X	X	X	X	X	X								
Cranes	2-4 Ton	Diesel	X	X	X	X	X										
	20 Ton	Diesel	X	X	X	X	X										
Miscellaneous	Pickup Trucks[e]	Gas	X	X	X	X	X	X	X								
	Pickup Trucks[e]	Gas	X	X	X	X	X	X	X								
Trucks	Heavy Dump Truck	Diesel	X	X	X												
	Pole Delivery Truck	Diesel	X	X	X	X	X										
	Cable/Conductor Delivery Truck	Diesel					X	X	X								
	Concrete Delivery Truck	Diesel	X	X	X												
	Bucket Truck	Diesel			X	X	X	X	X								
	Drum Puller Truck	Diesel					X	X	X								
	Dual Tensioner Truck	Diesel					X	X	X								
Morgan Substation (Common for Both Site)																	
Compressors	ICE/Air Compressor	Diesel		X	X												
Excavating	Dozer	Diesel	X														
	Grader	Diesel	X														
	Grader	Diesel	X														
	Front-End Loader (2-3 cy)	Diesel	X	X	X												
	Backhoe	Diesel		X	X												
	Sheepsfoot Compactor	Diesel	X														
	Boring Vehicle	Diesel		X	X												
Cranes	5 ton	Diesel			X	X	X	X									
Generator	7000W Portable	Gas					X	X	X	X							
Miscellaneous	Pickup Truck	Gas	X	X	X	X	X	X	X	X							
	Pickup Truck	Gas	X	X	X	X	X	X									

Table 8.1-11. (Continued)

Equipment Classification	Equipment Type	Fuel	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Main Site (Quantities are per site.)																	
Portable Welders	Electric Arc Welder	Electric					X	X									
Trucks	Heavy Dump Truck	Diesel	X	X	X												
	Heavy Equipment Delivery Truck	Diesel					X	X									
	Heavy Equipment Delivery Truck	Diesel			X	X											
	Water Truck	Diesel	X														
	Concrete Delivery Truck	Diesel		X	X												
	Bucket Truck	Diesel			X	X	X	X									

X = Equipment is in use during the month.

Table 8.1-12. Estimated Criteria Pollutant Emissions From Construction Equipment (Per Site)

	VOC	CO	NO_x	SO_x	PM_{10}
Main Site					
Worst-Case Hourly Emissions (lbs/hr)[a]	3.9	64.4	54.3	5.6	3.5
Worst-Case Monthly Emissions (lbs/month)[b]	740	12,870	10,346	1,081	675
Worst-Case Annual Emissions (tons/yr)[c]	3.0	41.7	30.0	2.7	2.2
Morgan Substation					
Worst-Case Hourly Emissions (lbs/hr)[a]	1.16	15.6	15.0	1.42	1.04
Worst-Case Monthly Emissions (lbs/month)[b]	231	3,127	3,002	283	230
Worst-Case Annual Emissions (tons/yr)[c]	0.6	7.8	5.6	0.5	0.4
Transmission Line					
Worst-Case Hourly Emissions (lbs/hr)[a]	1.16	7.01	17.2	1.69	1.13
Worst-Case Monthly Emissions (lbs/month)[b]	233	1,402	3,437	337	248
Worst-Case Annual Emissions (tons/yr)[c]	0.6	3.5	8.6	0.8	0.6

[a] Total hourly emissions were multiplied by 75% based on the assumption that only 75% of the total equipment will be operating simultaneously.

[b] Using the estimated construction schedule, monthly emissions were estimated for each piece of equipment assuming 200 hours of use per month. Total emissions were multiplied by 75% based on the assumption that only 75% of the total equipment operating in a given month will operate simultaneously.

[c] Worst case annual emissions were estimated by summing emissions for each 12 month period (i.e., months 1-12, 2-13, etc.) during the 15 month construction period and taking the maximum emissions for the worst 12-month period (i.e., month 1-12). Total emissions were multiplied by 75% based on the assumption that only 75% of the total equipment operating in a given month will operate simultaneously.

Table 8.1-13. Criteria Pollutant Emission Rates for the South Star Project Turbines and SCR with Ammonia Injection During Normal Operation (pounds per hour)

Load [1]	Pollutant	Ambient Temperature		
		15ºF	65ºF	115ºF
100%	VOC	0.5	0.4	0.4
	CO	2.8	2.5	2.3
	NO_x	2.3	2.1	1.9
	SO_2 [2]	0.26	0.23	0.22
	PM_{10}	3.5	3.5	3.5

1. The turbines will operation only at 100 percent load except during startup and shutdown.
2. SO_2 emission estimates are based on an assumed natural gas total sulfur content of 0.25 grains S per 100 dscf of natural gas.

Table 8.1-14. Annual Emissions for the South Star Project (per facility)

Pollutant	Emissions (tons/years)	
	16-6 case[a,b]	24-7 case[e]
VOC	**13.3**	7.40
CO	**74.4**	45.6
NO_x	27.0	**36.1**
SO_2	3.96 [c]	**4.18**
PM_{10}	36.8 [d]	**59.6**

[a]Emissions are for operation of four turbines.
[b]Emissions include 313 startup and 313 shutdown events with the balance of the time operating at 100% load at 65ºF (16 hr/day, 6 day/wk).
[c]SO_2 emissions are based on an assumed natural gas total sulfur content of 0.25 grains S/100 dscf.
[d]PM_{10} emissions are based on emissions rate provided by the turbine vendor, which includes both filterable (front-half) and condensable (back-half) particulates.

[e]Emissions include 20 startup and 20 shutdown events with the balance of time operating at 100% load at 65ºF, less 3% downtime (24 hr/day, 7 day/wk).

Boldface values denote worst-case.

Table 8.1-15. South Star Construction Emissions Scenarios and Release Parameters

	Stack Characteristics (for the Construction Zone)			
Emissions Scenario	Stack Height (m)	Stack Diameter (m)	Exhaust Temp (K)	Exhaust Velocity (m/s)
Construction Equipment[a]	3.05	0.15	700	40
	Volume Height (m)	Release Height (m)	Lateral Distance (m)	
Fugitive Dust[b]	3.05	3.05	150	

[a]The data shown represent the surrogate stack and release parameters for four release points.
[b]The data shown were used in the ISCST3 model to define a volume source.

Table 8.1-16. Stack Locations for the South Star Project

	Easting (m)	Northing (m)	Base Elevation (m)	Stack Height (m)	Stack Diameter (m)
South Star I					
Turbine 1	270283	3891589	481.58	24.38	2.896
Turbine 2	270306	3891561	481.58	24.38	2.896
Turbine 3	270328	3891534	481.58	24.38	2.896
Turbine 4	270351	3891507	481.58	24.38	2.896
South Star II					
Turbine 1	268195	3893029	518.6	24.38	2.896
Turbine 2	268225	3893011	518.6	24.38	2.896
Turbine 3	268256	3892992	518.6	24.38	2.896
Turbine 4	268286	3892974	518.6	24.38	2.896

Table 8.1-17. Stack Exhaust Parameters for the South Star Project Screening Analysis

Operating Scenario	Turbine Load (%)	Ambient Temperature (F)	Exhaust Exit Velocity (m/s)	Exhaust Exit Temperature (K)
Scenario 1	100	15	17.14	380.93
Scenario 7	100	65	14.97	372.04
Scenario 10	100	115	13.92	375.37

Table 8.1-18. Screening Analysis Results for South Star I

Averaging Period	Operating Scenario	Unit Impact (μg/m³)/(g/s)	Emission Rate (g/s)				Modeled Impact (μg/m³)			
			NO_x	CO	PM_{10}	SO_2	NO_x	CO	PM_{10}	SO_2
Annual	Scenario 1	0.8772	0.29	- -	0.441	0.033	0.254	- -	0.387	0.029
	Scenario 7	1.08131	0.265	- -	0.441	0.029	0.287	- -	0.477	0.0314
	Scenario 10	1.1156	0.239	- -	0.441	0.027	0.267	- -	0.492	0.030
1-Hour	Scenario 1	110.5605	0.29	0.353	- -	0.033	32.1	39.0	- -	3.6
	Scenario 7	120.8784	0.265	0.315	- -	0.029	32.0	38.1	- -	3.5
	Scenario 10	121.8552	0.239	0.290	- -	0.027	29.1	35.3	- -	3.3
3-Hour	Scenario 1	50.8645	- -	- -	- -	0.033	- -	- -	- -	1.7
	Scenario 7	56.85603	- -	- -	- -	0.029	- -	- -	- -	1.6
	Scenario 10	57.71859	- -	- -	- -	0.027	- -	- -	- -	1.6
8-Hour	Scenario 1	19.07419	- -	0.353	- -	- -	- -	6.7	- -	- -
	Scenario 7	21.32101	- -	0.315	- -	- -	- -	6.7	- -	- -
	Scenario 10	21.64447	- -	0.290	- -	- -	- -	6.3	- -	- -
24-Hour	Scenario 1	7.19099	- -	- -	0.441	0.033	- -	- -	3.171	0.24
	Scenario 7	8.10252	- -	- -	0.441	0.029	- -	- -	3.573	0.234973
	Scenario 10	8.23827	- -	- -	0.441	0.027	- -	- -	3.633	0.22

Table 8.1-19. Screening Analysis Results for South Star II

Averaging Period	Operating Scenario	Unit Impact (g/m^3)/(g/s)	Emission Rate (g/s)				Modeled Impact (g/m^3)			
			NOx	CO	PM10	SO2	NOx	CO	PM10	SO2
Annual	Scenario 1	1.03724	0.29	- -	0.441	0.033	0.301	- -	0.457	0.034
	Scenario 7	1.2658	0.265	- -	0.441	0.029	0.3354	- -	0.558	0.03671
	Scenario 10	1.30617	0.239	- -	0.441	0.027	0.312	- -	0.576	0.035
1-Hour	Scenario 1	165.0931	0.29	0.353	- -	0.033	47.9	58.3	- -	5.4
	Scenario 7	175.1417	0.265	0.315	- -	0.029	46.41	55.7	- -	5.1
	Scenario 10	176.8549	0.239	0.290	- -	0.027	42.3	51.3	- -	4.8
3-Hour	Scenario 1	92.2674	- -	- -	- -	0.033	- -	- -	- -	3.04
	Scenario 7	103.8567	- -	- -	- -	0.029	- -	- -	- -	3.01
	Scenario 10	105.3996	- -	- -	- -	0.027	- -	- -	- -	2.8
8-Hour	Scenario 1	34.60028	- -	0.353	- -	- -	- -	12.2	- -	- -
	Scenario 7	38.94627	- -	0.315	- -	- -	- -	12.3	- -	- -
	Scenario 10	39.52485	- -	0.290	- -	- -	- -	11.5	- -	- -
24-Hour	Scenario 1	12.84451	- -	- -	0.441	0.033	- -	- -	5.664	0.42
	Scenario 7	14.67043	- -	- -	0.441	0.029	- -	- -	6.470	0.42544
	Scenario 10	14.9313	- -	- -	0.441	0.027	- -	- -	6.585	0.40

Table 8.1-20. South Star I ISCST3 Modeling Results

Pollutant	Averaging Period	Maximum Modeled Impact (µg/m³)	PSD Significant Impact Level[a] (µg/m³)	Background (µg/m³)	Total Predicted Concentration (µg/m³)	AAQS (µg/m³)	UTM Coordinates East (m)	UTM Coordinates North (m)
Construction Impacts								
CO	1-hour	4,180	NA	2,941	7,121	23,000	270,253	3,891,370
	8-hour	2,003	NA	2,222	4,225	10,000	270,295	3,891,460
NO_2	1-hour	518[b,e]	NA	97	615[e]	470		
	Annual	27.0[d]	NA	16.6	43.6	100	270,262	3,891,463
PM_{10}	24-hour	55.7	NA	109	165	50	270,367	3,891,472
	Annual	5.28	NA	39.8	45.1	30	270,295	3,891,460
SO_2	1-hour	365	NA	104	469	655	270,253	3,891,370
	3-hour	222	NA	57	279	1,300	270,295	3,891,460
	24-hour	28.3	NA	20	48.3	105	270,295	3,891,460
	Annual	2.97	NA	1.8	4.77	80	270,262	3,891,463
Turbine Impacts (four turbines)								
CO	1-hour	740	2,000	2,941	3,681	23,000	269,425	3,890700
	8-hour	23.8	500	2,222	2,246	10,000	269,875	3,890,250
NO_2	1-hour	106[c]	NA	97	203	470	269,400	3,890,725
	Annual	0.22[d]	1	16.6	16.8	100	270,000	3,890,925
PM_{10}	24-hour	4.03	5	109	113	50	270,175	3,889,950
	Annual	0.48	1	39.8	40.3	30	270,000	3,890,925
SO_2	1-hour	24.8	NA	104	129	655	269,400	3,890,725
	3-hour	5.14	25	57	62.14	1,300	269,450	3,890,500
	24-hour	0.40	5	20	20.4	105	270,250	3,890,325
	Annual	0.04	1	1.8	1.84	80	270,000	3,890,925

[a]Source: 40 CFR 52.21
[b]Result obtained using the Ozone Limiting Method (OLM)
[c]Result obtained assuming 100% conversion of NO_x to NO_2
[d]Result obtained using the Ambient Ratio Method (ARM) default value 0.75
[e]Although conservative guideline modeling techniques predict short-term concentrations above the AAQS, these modeling techniques do not accurately reflect near-field plume chemistry. When such chemistry is considered, it is reasonable to conclude that no short-term violation of the AAQS will actually occur during construction (see text for further explanation).

AAQS = Most stringent ambient air quality standard for the averaging period.

NA = Not applicable
m = meters
µg/m³ = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than or equal to 10 microns in diameter
SO_2 = sulfur dioxide

Table 8.1-21. South Star II ISCST3 Modeling Results

Pollutant	Averaging Period	Maximum Modeled Impact (μg/m³)	PSD Significant Impact Level[a] (μg/m³)	Background (μg/m³)	Total Predicted Concentration (μg/m³)	AAQS (μg/m³)	UTM Coordinates East (m)	UTM Coordinates North (m)
Construction Impacts								
CO	1-hour	4,369	NA	2,941	7,310	23,000	268,062	3,892,945
	8-hour	2,457	NA	2,222	4,679	10,000	268,187	3,892,920
NO_2	1-hour	534[b,e]	NA	97	631[e]	470		
	Annual	27.8[d]	NA	16.6	44.4	100	268,199	3,892,919
PM_{10}	24-hour	47.2	NA	109	156	50	268,137	3,893,045
	Annual	5.13	NA	39.8	44.9	30	268,187	3,892,895
SO_2	1-hour	382	NA	104	486	655	268,062	3,892,945
	3-hour	277	NA	57	334	1,300	268,180	3,892,931
	24-hour	39.0	NA	20	59.0	105	268,187	3,892,920
	Annual	3.43	NA	1.8	5.23	80	268,199	3,892,919
Turbine Impacts (four turbines)								
CO	1-hour	1,242	2,000	2,941	4,183	23,000	267,600	3,892,550
	8-hour	41.2	500	2,222	2,263	10,000	267,725	3,892,350
NO_2	1-hour	177[c]	NA	97	274	470	267,600	3,892,550
	Annual	0.25[d]	1	16.6	16.9	100	267,800	3,892,350
PM_{10}	24-hour	7.0	5	109	116	50	267,725	3,892,350
	Annual	0.55	1	39.8	40.4	30	267,800	3,892,350
SO_2	1-hour	41.4	NA	104	145	655	267,600	3,892,550
	3-hour	9.3	25	57	66.3	1,300	267,725	3,892,350
	24-hour	0.71	5	20	20.7	105	267,750	3,892,350
	Annual	0.04	1	1.8	1.84	80	267,800	3,892,350

[a]Source: 40 CFR 52.21
[b]Result obtained using the Ozone Limiting Method (OLM)
[c]Result obtained assuming 100% conversion of NO_x to NO_2
[d]Result obtained using the Ambient Ratio Method (ARM) default value 0.75
[e]Although conservative guideline modeling techniques predict short-term concentrations above the AAQS, these modeling techniques do not accurately reflect near-field plume chemistry. When such chemistry is considered, it is reasonable to conclude that no short-term violation of the AAQS will actually occur during construction (see text for further explanation).

AAQS = Most stringent ambient air quality standard for the averaging period.

NA = Not applicable
m = meters
μg/m³ = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than or equal to 10 microns in diameter
SO_2 = sulfur dioxide

Table 8.1-22. Commissioning Modeling Analysis Results

Pollutant	# Turbines	Emission Rate per turb. (lb/hr)	Turbine Load	Modeling Results (µg/m3) Site I	Modeling Results (µg/m3) Site II	Background (µg/m3)	Total Predicted Concentration (µg/m3) Site I	Total Predicted Concentration (µg/m3) Site II	AAQS (µg/m3)	Emission Rate Basis
NO_2 1-hr	2	230	100%	280.6	359.3	97	377.6	456.3	470	100x base rate
CO 1-hr	2	700	100%	4892	7342	2,941	7,833	10,283	23,000	1,000 ppm CO
CO 8-hr	4	175	100%	421	763	2,222	2,643	2,985	10,000	500 ppm CO
PM_{10} 24-hr	4	1.75	60%	2.60	4.29	118	121	122	50	3x base rate of 3.5 lb/hr
SO_2 1-hr	2	0.39	100%	2.73	4.09	104	106.73	108.09	655	1.5x base rate
SO_2 3-hr	2	0.39	100%	1.28	2.28	68	69.28	70.28	1,300	1.5x base rate
SO_2 24-hr	4	0.065	100%	0.06	0.105	38	38.06	38.105	105	1.5x base rate

Emissions based on a maximum of 2 turbines operating simultaneously for no more than 4 hours.
NO_2 modeled using OLM.

Table 8.1-23. Modeled Stack Parameters for the Cumulative Impact Analysis

Source	UTM Easting (m)	UTM Northing (m)	Stack Base Elevation (m)	Stack Height (m)	Exhaust Temperature (K)	Exhaust Exit Velocity (m/s)	Stack Diameter (m)
Sunrise							
Turbine	264733	3899243	435.9	45.72	351.09	12.51905	5.7912
Elk Hills							
Turbines	275431	3906680	405.4	36.58	361.76	21.27	5.49
Western Midway-Sunset							
Turbines	260549	3901337	559.0	42.60	359.00	21.12	5.79
La Paloma							
Turbines	264065	3908683	301.6	39.93	357.00	18.29	5.33
Aux. Boiler	264115	3908683	300.6	20.08	580.40	7.1	0.41
South Star I							
Turbine 1	270283	3891589	481.6	24.38	372.04	14.97	2.896
Turbine 2	270306	3891561	481.6	24.38	372.04	14.97	2.896
Turbine 3	270328	3891534	481.6	24.38	372.04	14.97	2.896
Turbine 4	270351	3891507	481.6	24.38	372.04	14.97	2.896
South Star II							
Turbine 1	268195	3893029	518.2	24.38	372.04	14.97	2.896
Turbine 2	268226	3893011	518.2	24.38	372.04	14.97	2.896
Turbine 3	268256	3892992	518.2	24.38	372.04	14.97	2.896
Turbine 4	268286	3892974	518.2	24.38	372.04	14.97	2.896
Hanover, L.P.							
Turbine	261600	3902629	500.0	16.00	755.00	24.69545	2.743

Table 8.1-24. Modeled Emission Rates for the Cumulative Impact Analysis

	NO_x		CO		PM_{10}		SO_2			
Source	**1-Hour**	**Annual**	**1-Hour**	**8-Hour**	**24-Hour**	**Annual**	**1-Hour**	**3-Hour**	**24-Hour**	**Annual**
Sunrise	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
Turbine	15.354	6.187	7.343	7.343	1.659	0.986	0.97	0.97	0.674	0.38
Elk Hills										
Turbines	3.982	3.982	3.15	3.15	4.536	4.536	0.908	0.908	0.908	0.908
Western Midway-Sunset										
Turbines	4.46	4.131	6.527	6.527	4.358	2.181	1.008	1.008	0.982	0.866
La Paloma										
Turbines	8.719	8.719	15.83	15.83	8.669	8.669	1.961	1.961	1.961	1.961
Aux. Boiler	1.30E-02	1.30E-02	3.29E-02	3.29E-02	5.42E-03	5.42E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03
South Star I										
Turbine 1	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 2	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 3	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 4	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
South Star II										
Turbine 1	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 2	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 3	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Turbine 4	0.29	0.265	0.353	0.353	0.441	0.441	0.033	0.033	0.033	0.030
Hanover, L.P.										
Turbine	0.486	0.286	1.186	1.186	0.175	0.103	0.056	0.056	0.056	0.033

Table 8.1-25. Cumulative Modeling Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Predicted Concentration ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	UTM Coordinates East (m)	UTM Coordinates North (m)
Cumulative Impacts							
CO	1-hour	63.9	2,941	3,005	23,000	267600	3892300
	8-hour	16.1	2,222	2,238	10,000	267700	3892300
NO_2	1-hour	113	97	210	470	262000	3898000
	Annual	0.64	20.6	21.2	100	264000	3896000
PM_{10}	24-hour	7.08	118	125	50	267700	3892300
	Annual	0.83	42.6	43.4	30	267800	3892400
SO_2	1-hour	7.90	104	112	655	263000	3904000
	3-hour	4.59	68	73	1,300	264000	3895500
	24-hour	0.80	38	39	105	265000	3904000
	Annual	0.08	1.8	1.9	80	260000	3900000

Table 8.1-26. Rule 2201 Emission Offset Requirements for the South Star Project

Pollutant	Attainment Status	Rule 2201 Offset Threshold	Applicable Project Emissions Per Site
NO_x	A/NA[a]	10 ton/yr	36.1 ton/yr[c]
VOC	NA[b]	10 ton/yr	13.3 ton/yr[c]
PM_{10}	NA	80 lb/day	347 lb/day[d]
SO_2	A	150 lb/day	34.8 lb/day[d]
CO	A	550 lb/day	584 lb/day[d]

A = Attainment NA = Nonattainment

[a] The area attains both state and federal NO_2 AAQS, but NO_x emissions are considered a precursor to ozone. The area is classified nonattainment for both California and federal ozone AAQS.

[b] VOC emissions are considered a precursor to ozone, a nonattainment pollutant.

[c] Based on annual average emissions at 65°F ambient.

[d] Based on worst-case daily emissions at 15°F ambient.

Table 8.1-27. Comparison of South Star Project Offset Requirements under SJVAPCD Rule 2201 and/or CEQA and Total Banked ERCs Under Consideration

	NO_x	VOC	PM_{10}	SO_2
South Star Project Emissions, ton/yr[a]	72.1	26.5	119.2	8.4
Required ERCs at 1.3:1, ton/yr	67.8[b]	8.5[b]	--	222.9[c]
Required ERCs at 1.5:1, ton/yr	78.2[b]	9.8[b]	--	246.7[c]
Total Banked ERCs under consideration	78.2	9.8	--	246.7

[a] See Appendix B for calculations

[b] Emission offset requirements reflect a 10 tpy reduction per site from stationary source potential to emit when determining offset requirements for new sources – see Rule 2201 Section 6.8.2.2. The 10 tpy reduction allowed for new sources is accounted for in the District Air Quality Attainment Plan Growth Allowance to ensure that overall levels of ozone precursors decline.

c Based on an SO2 for PM10 interpollutant offset ratio of 1.5 to 1 and 1 to 1 offsetting of primary SO2 for CEQA compliance

Table 8.1-28. Applicable Air Quality Permits or Approvals Required for the South Star Project

Agency	Permit Approval	Expected Filing Date
U.S. EPA Region IX	Prevention of Significant Deterioration	Not required
San Joaquin Valley Unified Air Pollution Control District	Determination of Compliance/Authority to Construct Permit Application	July 2001
	Acid Rain Permit Application	Within two years before startup (approximately August 2001)
	Title V Permit Application	Within one year after startup (approximately May 2002)

Table 8.1-29 South Star Project Summary of Compliance with Air Quality LORS

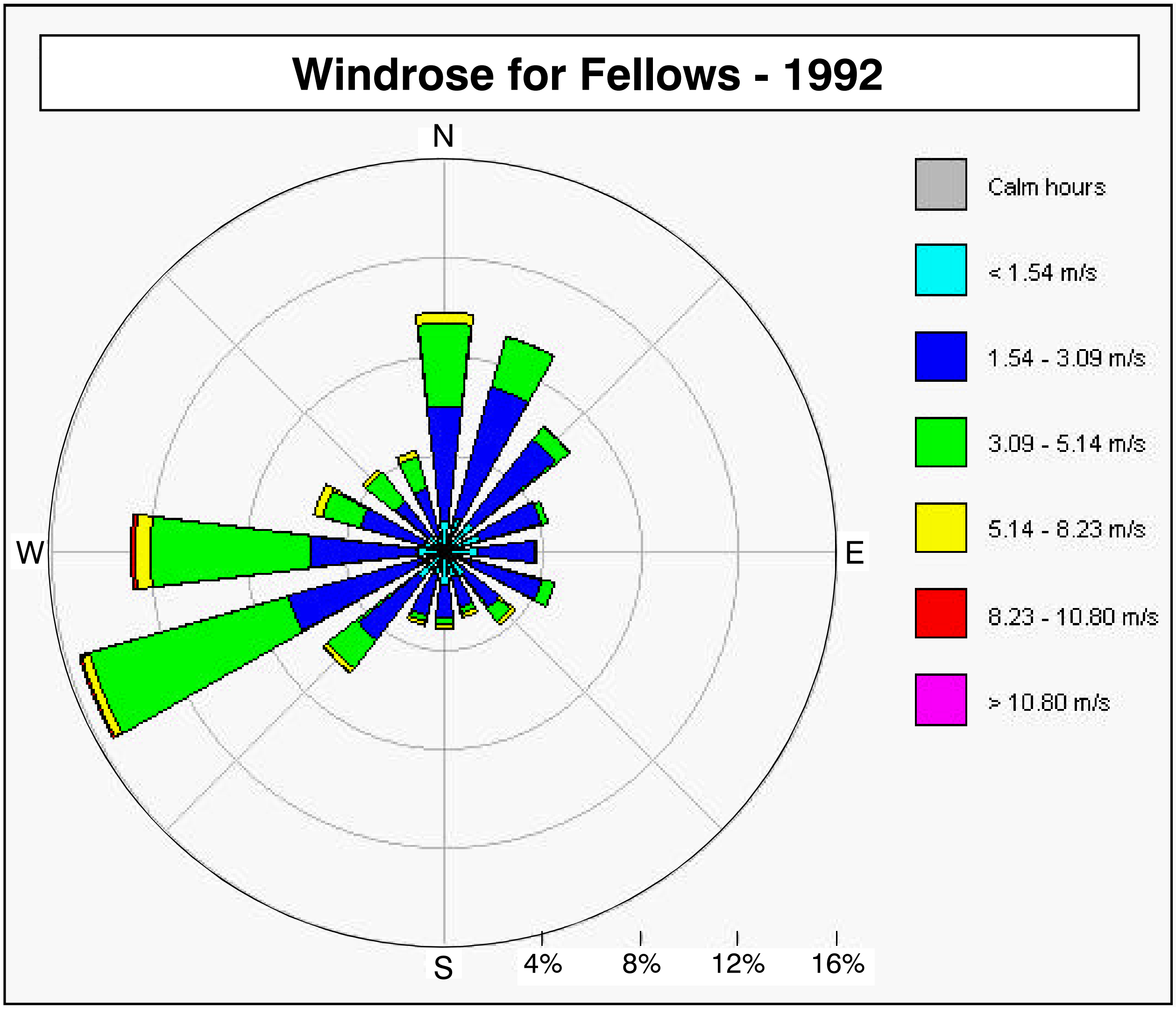
Authority	Administering Agency	Requirements	South Star Project Compliance
Federal CAAA of 1990; 40 CFR 50	U.S. EPA Region IX, CARB, SJVAPCD	National Ambient Air Quality Standards (NAAQS)	The South Star Project will not cause a violation of any national (or state) ambient air quality standard.
40 CFR 52.21	U.S. EPA Region IX	Prevention of Significant Deterioration (PSD); establishes PSD significance levels and increments; requires analysis to determine impacts on PSD increments and air quality related values (AQRVs) as defined by the federal land manager.	In Kern County, PSD (i.e., attainment) pollutants include NO_x, CO, and SO_2. South Star site emissions do not exceed PSD significant emissions threshold; therefore, PSD regulations do not apply. .
40 CFR 72, 73, 75	U.S. EPA Region IX	Acid rain requirements, SO_2 allowances.	The South Star Project will submit an Acid Rain permit. Continuous emissions monitoring (CEM) will be implemented.
40 CFR 60, Subpart GG; SJVUAPCD Rule 4001	SJVAPCD	New Source Performance Standards (NSPS); 0.011% by volume (110 ppmv) for NO_x and 0.015% by volume (150 ppmv) for SO_2.	The South Star Project emission rate for NO_x is 2.0 ppmv at 15% O_2; the SO_2 emission rate is < 1 ppmvd at 15% O_2. Both emission rates are well below the NSPS emission limit. Additionally CEM plans will be developed and CEM will be performed.
40 CFR 70; SJVUAPCD Rule 2520	SJVAPCD	Federally mandated operating permits.	The South Star Project will prepare and submit a Title V operating permit application no later than one year after operation begins.
California Administrative Code, Title 14, §15002(a)(3), CEQA Guideline	CEC	Power plant siting requirements.	This Application for Certification satisfies the CEC requirements.

Table 8.1-29. Continued

Authority	Administering Agency	Requirements	South Star Project Compliance
H&S Code § 4430	SJVAPCD	Air toxics "Hot Spots" emission inventory.	Because South Star Project criteria pollutant emissions will exceed 10 tons per year, it must submit an air toxics "Hot Spots" information and assessment report. This will be submitted the by South Star Project after commencement of operation (i.e., after May 2001).
Rule 2010	SJVAPCD	Authority to Construct (ATC) and Permit to Operate (PTO).	The Determination of Compliance (DOC) permit application forms are contained in Appendix B of this AFC, which is also application for the DOC.
Rule 2201	SJVAPCD	New Source Review (NSR).	NSR requirements have been met by the South Star Project and are demonstrated in the Section
Rule 4101	SJVAPCD	Visibility; prohibits visible emissions as dark or darker than No. 1 on the Ringelmann chart	The South Star Project will ensure compliance with the rule based on using only natural gas for combustion.
Rule 4102	SJVAPCD	Nuisance; prohibits discharge of emissions which cause injury, illness, detriment, nuisance, etc., to any considerable number of persons or to the public.	The South Star Project will ensure compliance with the rule based on using only natural gas for combustion.
Rule 4201	SJVAPCD	Total suspended particulate (TSP) emission limit of 0.1 grains per cubic foot of gas at dry standard conditions (gr/DSCF).	The South Star Project emission rate for PM_{10} is < 0.01 gr/DSCF, well below the TSP emission limit.
Rule 4703	SJVAPCD	Nitrogen oxides (NO_x) emission limit of 11.8 ppm at 15% O_2 and carbon monoxide (CO) emission limit of 200 ppm at 15% O_2.	The South Star emission rate for NO_x is 2.0 ppmv at 15% O_2; the CO emission rate is 4.0 ppmvd. Both the NO_x and CO emission rates are well below the Rule.
Rule 4801	SJVAPCD	Sulfur dioxide (SO_2) emission limit of 0.2% by volume (2,000 ppmv).	The South Star emission rate for SO_2 is < 1 ppmvd at 15% O_2, well below the Rule 4801 emission rate.
Rule 8010	SJVAPCD	Fugitive dust administrative requirements; reasonably available control measures (RACM).	The South Star Project will use dust control measures (e.g., water, etc.) necessary to achieve 50% control efficiency (minimum) according to Rule 8010 requirements.

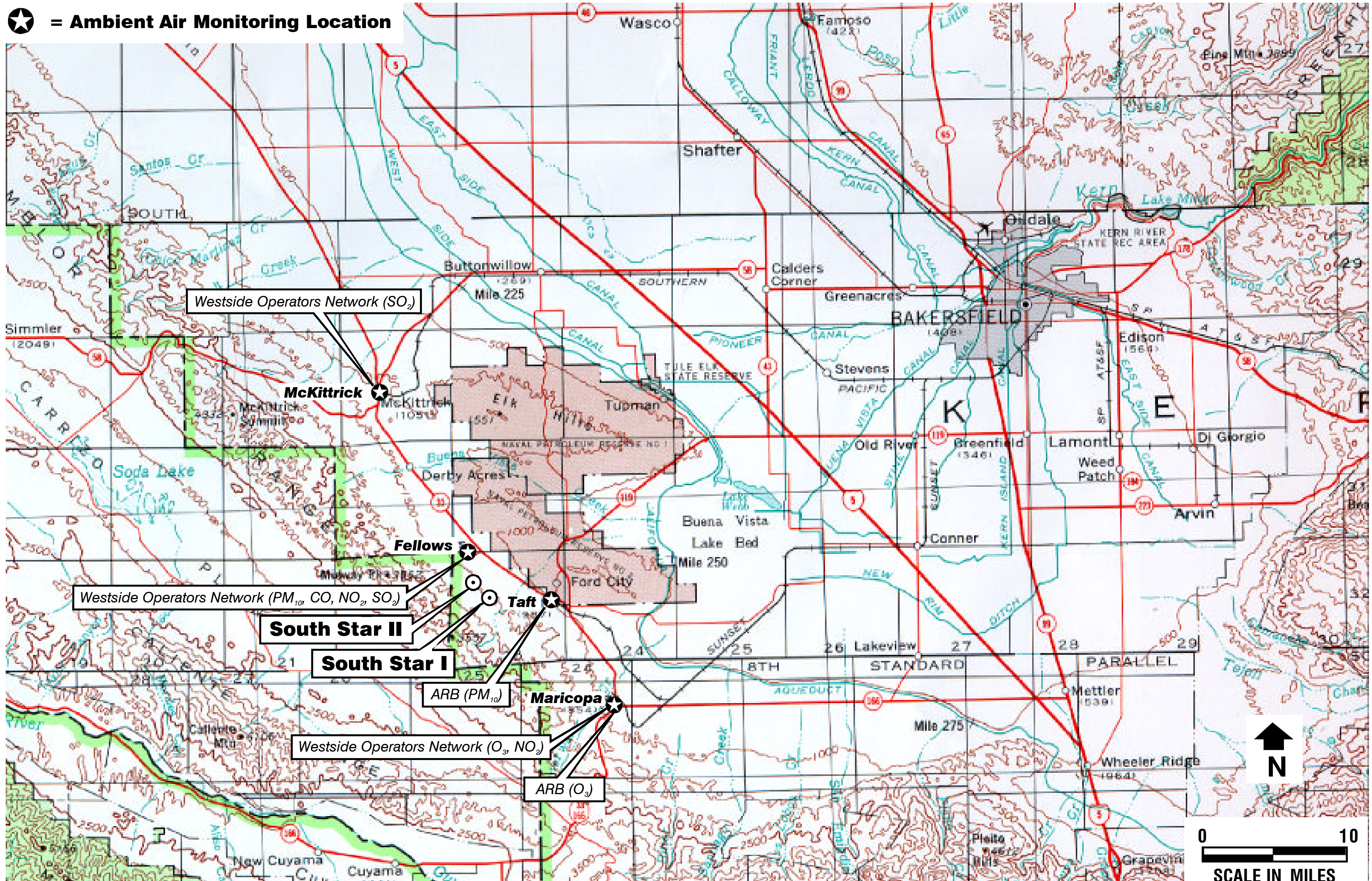
Table 8.1-29. Continued

Authority	Administering Agency	Requirements	South Star Project Compliance
Rule 8020	SJVAPCD	Fugitive dust, construction; requires RACM and prohibits opacity to exceed 40%.	The South Star Project will commit to implementing RACM during construction and controlling opacity from construction to a level below 40% (for a period or periods aggregating to more than three minutes in any one hour) per Rule 8020 requirements.



URS	Project No. 51-00167034.00 South Star Cogeneration Project	1992 ANNUAL WINDROSE FOR FELLOWS	Figure 8.1-1

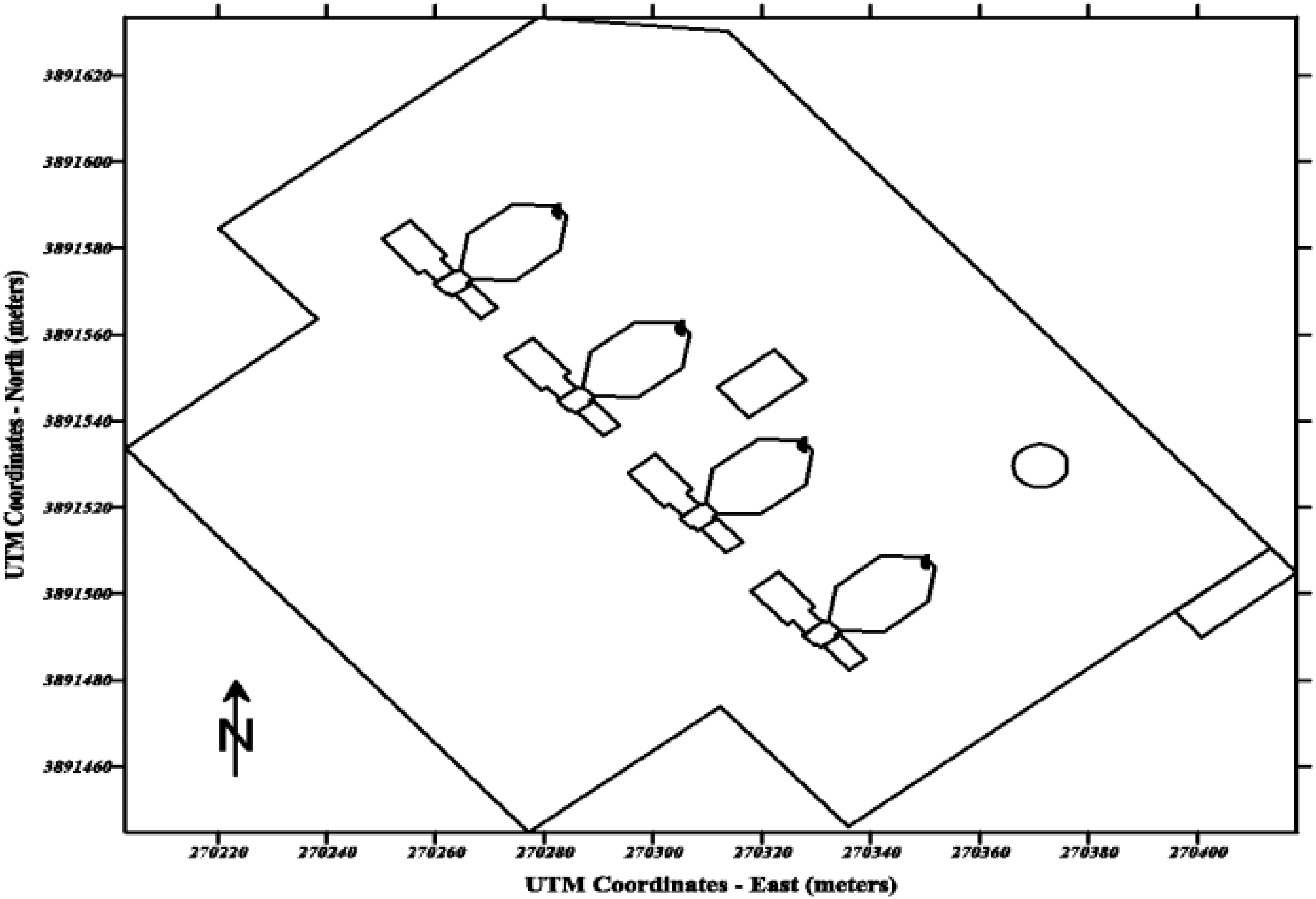
South Star\07-01-south-star-windroses.cdr - VMG 07/13/01 SAC



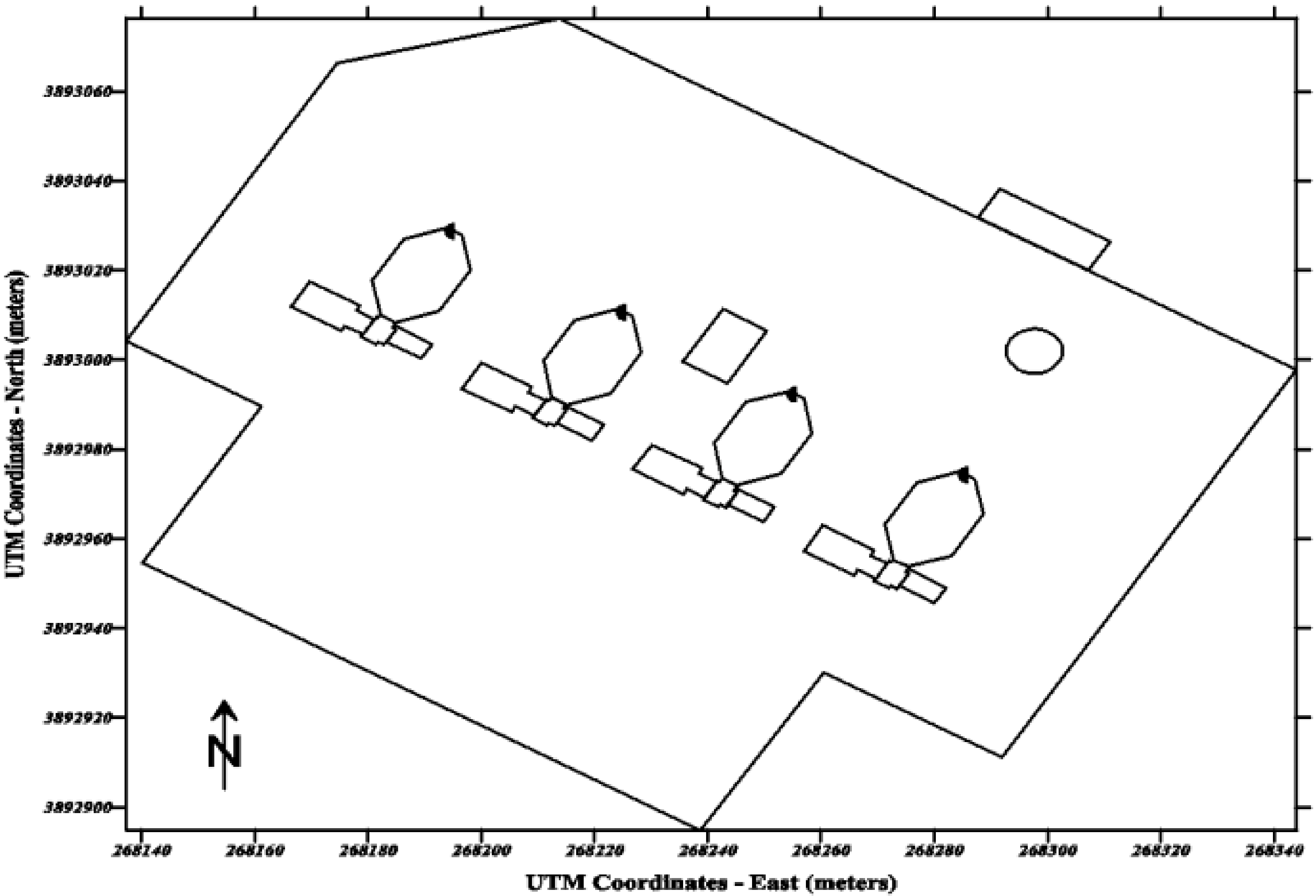
SOURCE: USGS 1:500,000 Scale Topographic Map of California, South Half

URS	Project No. 51-00167034.00	RELEVANT AMBIENT AIR MONITORING LOCATIONS FOR THE SOUTH STAR PROJECT SITE	Figure 8.1-2
	South Star Cogeneration Project		

South Star\07-01-south-star-air-monitoring-sites.cdr - VMG 07/16/01SAC



URS	South Star Cogeneration Project Project No. 51-00167034.00	South Star I Plot Plan Structures Used in Modeling Downwash Analysis	Figure 8.1-3



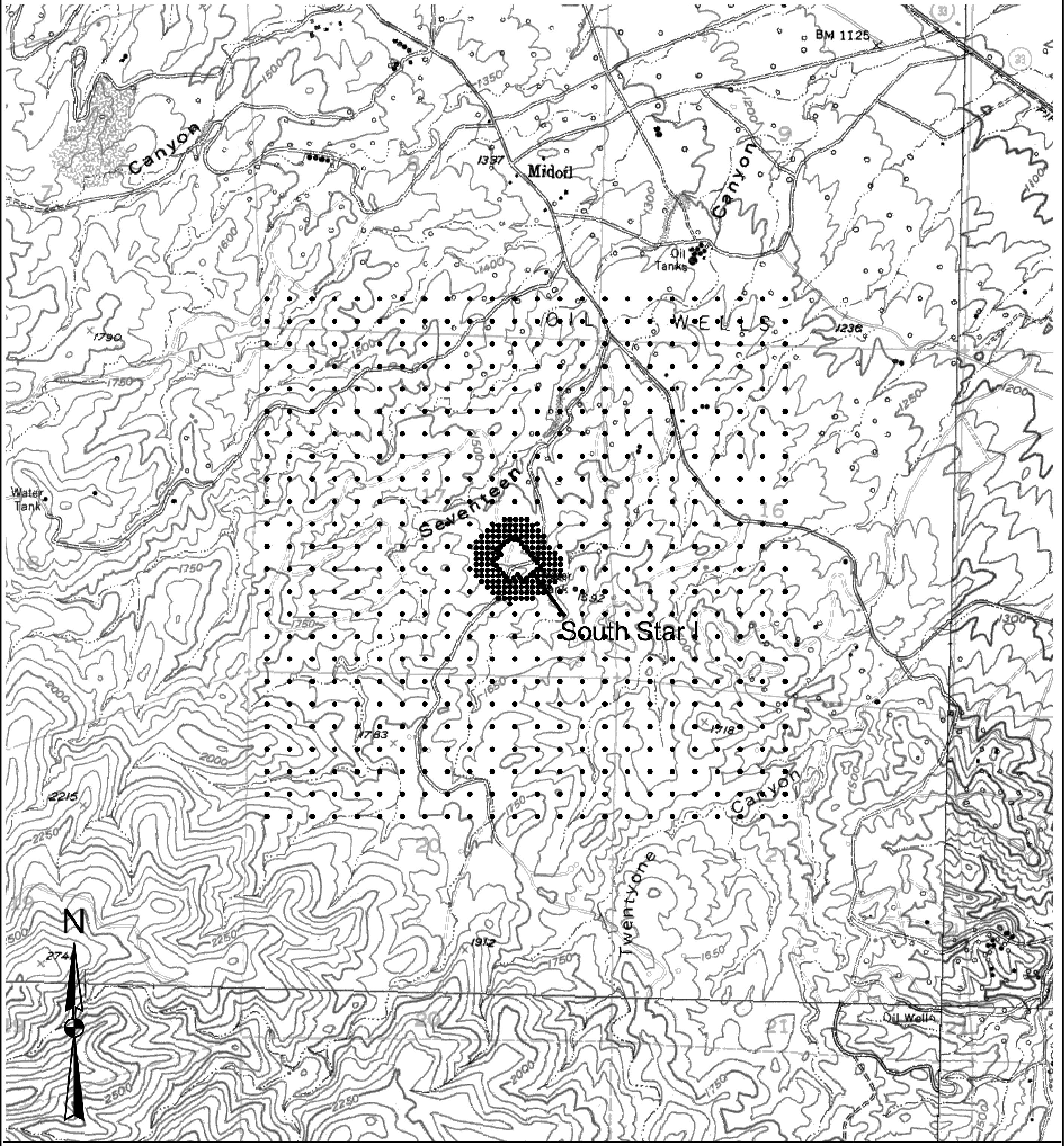
URS

South Star
Cogeneration Project

Project No. 51-00167034.00

South Star II Plot Plan
Structures Used in
Modeling Downwash Analysis

Figure
8.1-4



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Kilometers

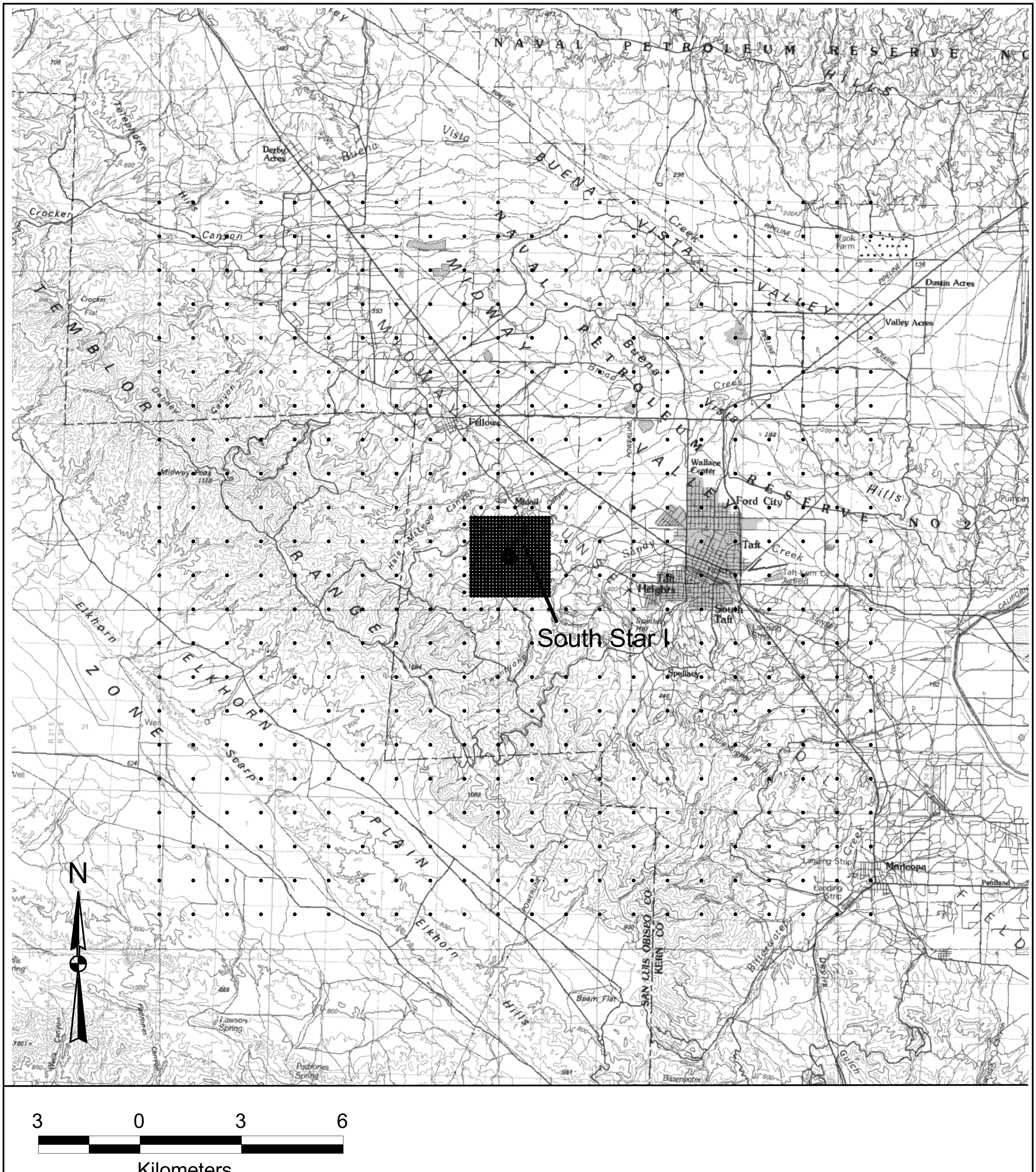
URS

South Star
Cogeneration Project

Project No. 51-00167034.00

South Star I Receptor Grid
Close-In Receptors

Figure
8.1-5



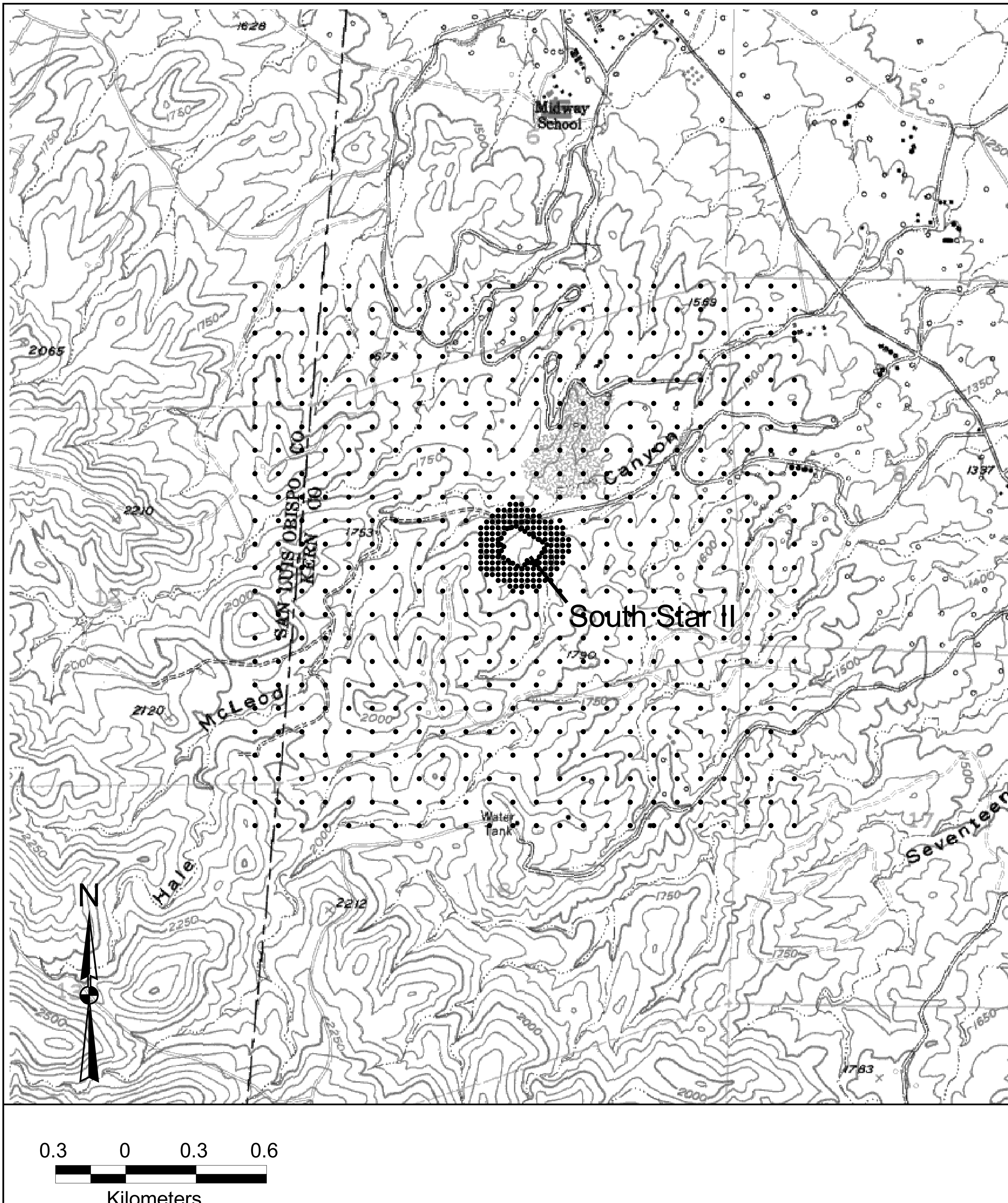
URS

South Star
Cogeneration Project

Project No. 51-00167034.00

South Star I Receptor Grid
All Receptors

Figure
8.1-6



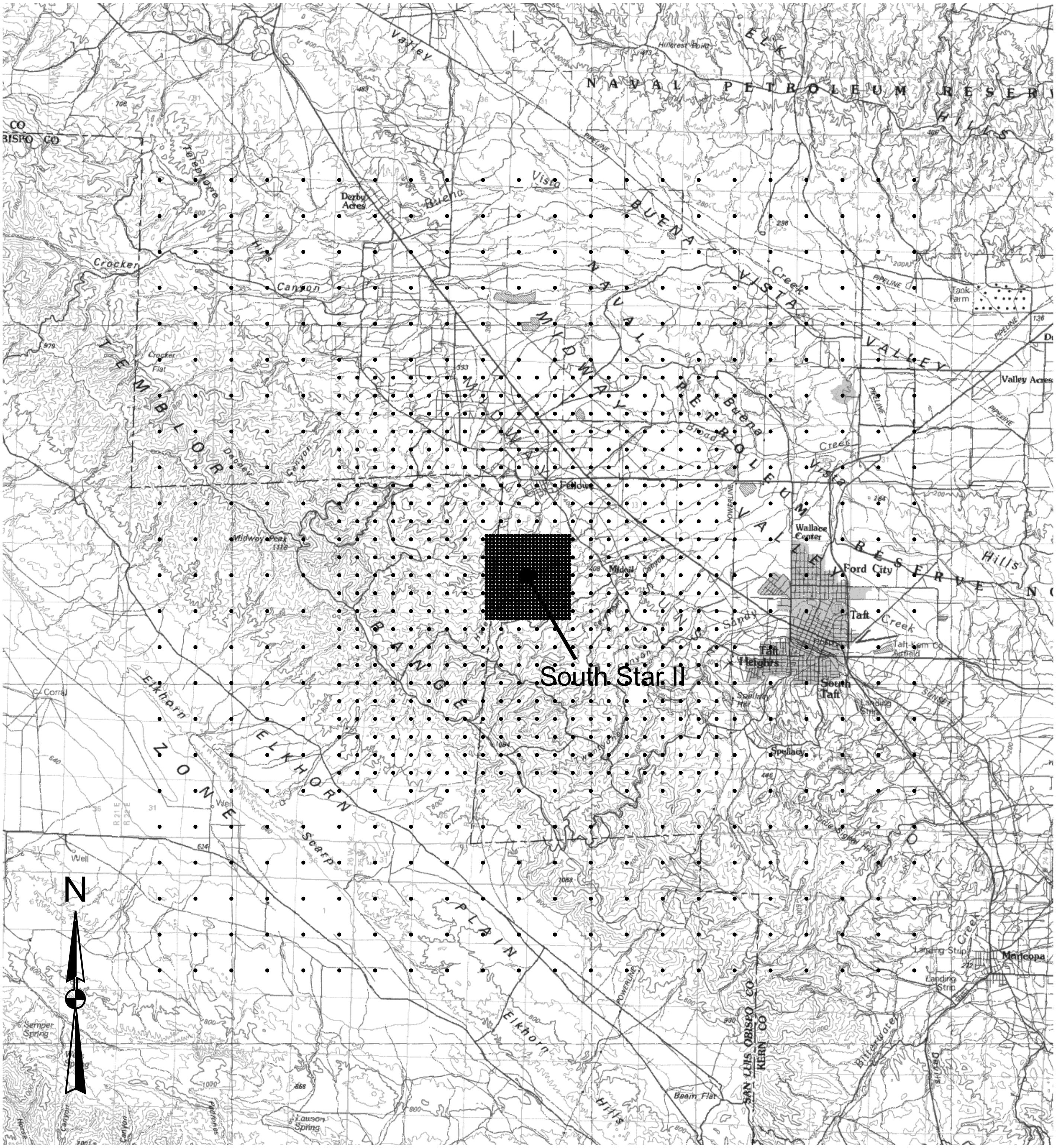
URS

South Star
Cogeneration Project

Project No. 51-00167034.00

South Star II Receptor Grid
Close-In Receptors

Figure
8.1-7



3 0 3 6

Kilometers

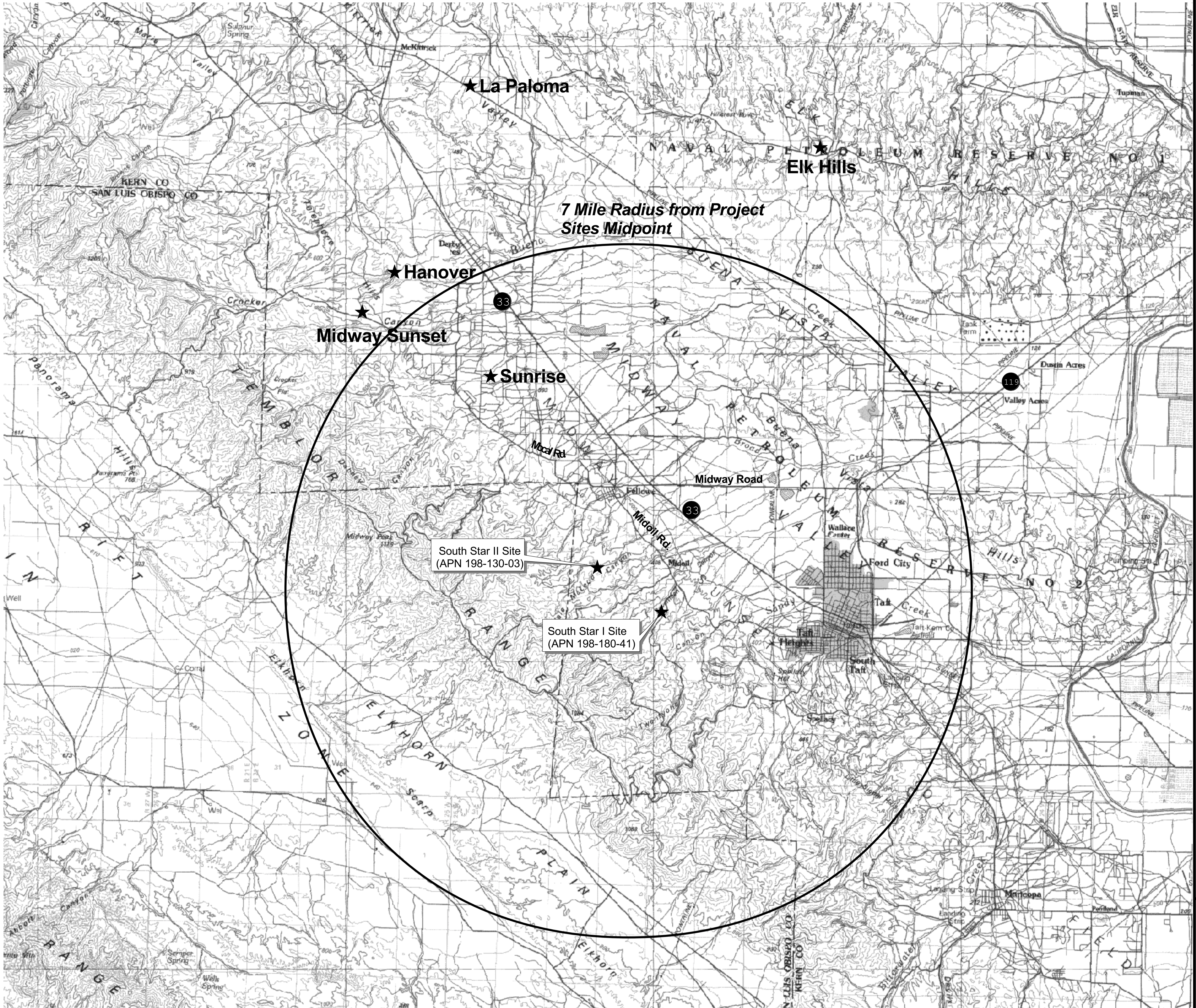
URS

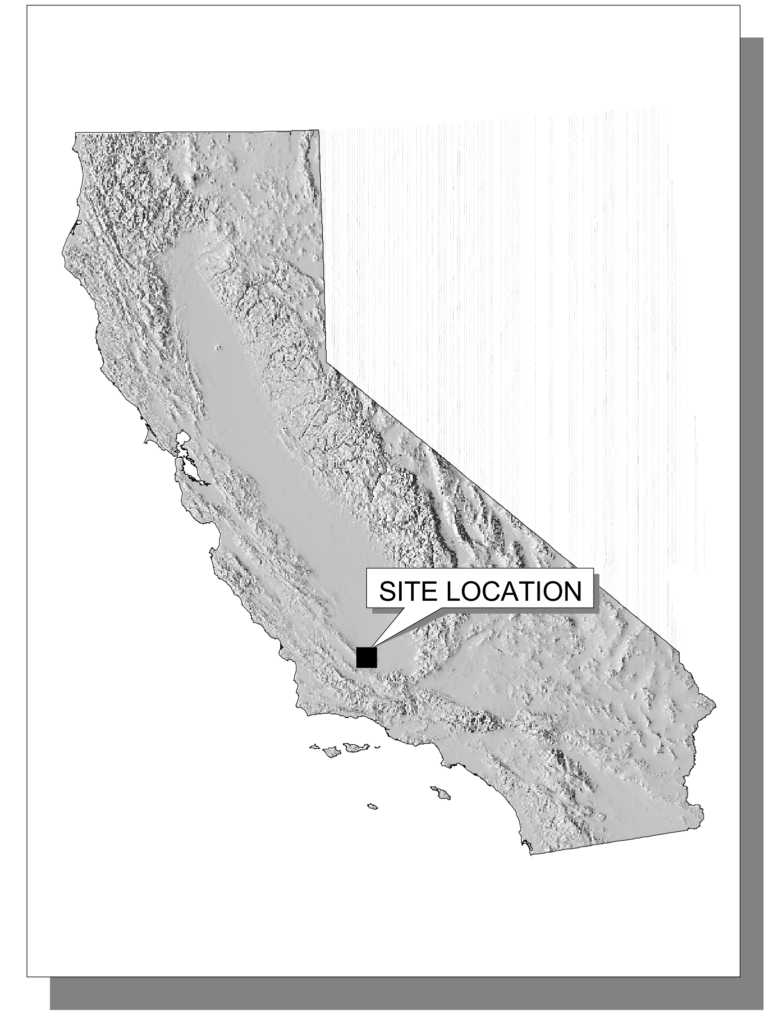
South Star Cogeneration Project

Project No. 51-00167034.00

South Star II Receptor Grid
All Receptors

Figure 8.1-8





SOURCE: USGS 1:100,000 Scale Topographic Map of Taft, California

Figure 8.1-9
Cumulative Modeling Domain and Sources